BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Consider Smart Grid Technologies Pursuant to Federal Legislation and on the Commission's own Motion to Actively Guide Policy in California's Development of a Smart Grid System.	Rulemaking 08-12-009 (Filed December 18, 2008)

ANNUAL STATUS REPORT OF SAN DIEGO GAS & ELECTRIC COMPANY (U 902 E) FOR SMART GRID DEPLOYMENTS AND INVESTMENTS

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October 1, 2014

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I. INTRODUCTION

Pursuant to Decision ("D.") 10-06-047[1/] in this proceeding, San Diego Gas & Electric Company ("SDG&E") hereby respectfully submits this annual status report. On June 24, 2010, the California Public Utilities Commission (CPUC) approved D.10-06-047, which directed Pacific Gas and Electric Company, Southern California Edison Company, and SDG&E to file an annual report in Rulemaking 08-12-009 on the status of Smart Grid investments commencing October 1, 2012, and annually thereafter through October 1, 2020.

In compliance with CPUC requirements for Smart Grid Deployment Plans pursuant to Senate Bill (SB) 17 (Padilla), / Chapter 327, Statutes of 2009, and to fulfill the regulatory obligations, this third annual status report provided by SDG&E pertains to the status of Smart Grid Investments up to July 1, 2014. In accordance with Ordering Paragraph 15 of D.10-06-047, the *SDG&E Smart Grid Deployment Plan* (SGDP) *2014 Annual Report,* which is attached as Appendix A, contains the following:

[1/] D.10-06-047, "*Decision Adopting Requirements for Smart Grid Deployment Plans Pursuant to Senate Bill 17(Padilla), Chapter 327, Statutes of 2009*" (issued June 28, 2010). Available at: http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/119902.htm.

a. A summary of the utility's deployment of Smart Grid technologies during the past year (July through June) and its progress toward meeting its *Smart Grid Deployment Plan*;

b. The costs and benefits of Smart Grid deployment to ratepayers during the past year, including a monetary estimate, to the extent possible, of the health and environmental benefits that may arise from the Smart Grid;

c. Current initiatives for Smart Grid deployments and investments;

d. Updates to the utility's security risk assessment and privacy threat assessment; and

e. The utility's compliance with North American Electric Reliability Corporation security rules and other security guidelines and standards as identified by the National Institute of Standards and Technology and adopted by the Federal Energy Regulatory Commission.

Respectfully submitted this 1st day of October 2014.

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APPENDIX A

SDG&E Smart Grid Deployment Plan
2014 ANNUAL REPORT

SDGE connected

A Sempra Energy utility℠

Smart Grid Deployment Plan

2014 Annual Report

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1 KEY TAKEAWAYS AND HIGHLIGHTS

The development and deployment of Smart Grid in the San Diego region continues to be driven by the customer adoption of technologies and the state's energy policy goals.

Customers are choosing renewable energy technologies, electric vehicles, energy management tools, and information services at an increasingly fast pace. That being said, challenges remain for the cost-effective realization of California's ambitious energy policy goals. It is in that context that SDG&E has aligned on its mission to provide a sustainable energy platform with differentiated offerings that enable customer choice and empower industry innovation.

Changes to SDG&E's power supply resource mix are impacting nearly every aspect of the region's electricity system. Substantial growth in centralized and distributed renewable energy resources place new demands on system planners, engineers, and operators to ensure reliability and power quality in a very dynamic environment. During days of peak production from renewable generation, the San Diego region already has several hundred megawatts (MW[1]) of solar and wind energy flowing to SDG&E customers. With hundreds more MW of additional solar and wind capacity in development, significant changes to the way SDG&E manages its resources and systems are already underway. SDG&E predicts it will reach the state's goal of a 33% renewable portfolio standard in 2014, a full six years ahead of the state's requirement.

At the same time, SDG&E's customers are installing rooftop solar energy systems on their homes and businesses in greater numbers, resulting in 46% overall growth in Net Energy Metering (NEM) generation capacity to nearly 269 MW during the 12 months ending June 30, 2013 (the "Reporting Period"). Due to intermittent power production they require new approaches to planning, engineering, and operation of the electric system to ensure their reliable integration.

SDG&E customers have installed distributed generation systems with a peak capacity of nearly 269 megawatts.

SDG&E is engaging customers who now have many more choices in the tools available to help them manage their energy use. Home Area Network (HAN) devices that are compatible with SDG&E's Smart Meter network, such as energy information displays and other energy management devices, are now available from multiple manufacturers and listed on SDGE.com. Customers can choose between a variety of online energy information services and mobile applications

[1] Unless otherwise noted, power capacity values (megawatt/MW and kilowatt/kW) are shown as alternating current (AC) nameplate ratings.

enabled by the open standards-based Green Button Connect My Data platform that provide valuable, detailed analysis of their Smart Meter data. Customers can easily and securely authorize these third parties to automatically receive energy usage data on a daily basis through a simple registration process on SDG&E's My Account portal.

SDG&E has also begun a deployment of programmable communicating thermostats to small and medium business customers, with nearly 2,400 demand response-capable devices installed at 290 businesses during the Reporting Period.

Figure 1 - EcoBee programmable communicating thermostat and mobile applications

Electric vehicle (EV) adoption also continues to show strong growth in the region, with the number of plug-in electric vehicles (PEVs) and plug-in hybrid electric vehicles (PHEVs) operated by San Diego drivers more than doubling to over 9,000 during the Reporting Period[2]. Because of their unique load characteristics, Smart Grid solutions are also essential to the reliable integration of PEVs and PHEVs into the electric grid while minimizing capital infrastructure costs. As an example, SDG&E has filed an application[3] with the CPUC for a Vehicle-Grid Integration pilot project that proposes to expand the availability of EV charging infrastructure at workplaces and multi-unit dwellings while managing their charging demands with an innovative dynamic rate structure. These solutions will enable PEVs and PHEVs and their charging infrastructure to become grid-integrated and to leverage Time of Use (TOU) and other alternative rate designs. It may allow SDG&E to integrate even higher levels of renewables in the future by absorbing excess production during the solar generation peak hours, and ramping down charging demand as solar production drops.

This *Smart Grid Deployment Plan – 2014 Annual Report* (*"Annual Report")* provides stakeholders with an update on SDG&E's Smart Grid deployment as the San Diego region continues its rapid advance towards a smarter and cleaner energy future.

Similar to the previous issuances in 2012 and 2013, this *Annual Report* provides a status update to SDG&E's Smart Grid metrics, deployment costs, and benefits for the Reporting Period. Other information provided in the report includes additional highlights through September 2014.

Highlights of SDG&E's Smart Grid deployment update include:

[2] Neighborhood electric vehicles (street legal plug-in vehicles with a maximum speed of 35mph) have been excluded.
[3] A.14-04-14

- Overall estimated Smart Grid costs of ~$114.5 million and ~$54 million in benefits during the Reporting Period
- 55 Smart Grid and related enterprise[4] projects completed, in progress or planned
- New customer-facing products and services enabled by Smart Meters, including several new products and services such as energy marketplace (pending CPUC approval in SDG&E's Energy Efficiency application[5]) and an in-home display "loaner program," that are scheduled for introduction in early 2015
- Initiated continuous improvements to previously completed transformative foundation projects such as the Outage Management System/Distribution Management System (OMS/DMS) to gain additional operational benefits
- Proved real-world operations of the Borrego Springs Microgrid, the largest grid-tied community-scale microgrid in the U.S., by islanding and carrying customers through multiple unplanned outages; restoring service to many homes and businesses while repairs to the larger grid were being made (see Figure 2)
- Facilitated strong growth in distributed generation, with nearly 14,000 new systems (primarily solar) connected by customers during the Reporting Period, for a total of 38,979 residential and commercial systems connected (approximately 3% of SDG&E's residential customer base now has rooftop solar installed) as of the end of the Reporting Period
- Experienced PEV growth to more than 9,000 total vehicles connecting to SDG&E's system at the end of the Reporting Period[6], with more than 44% of PEV customers enrolled in time-differentiated EV rates that encourage off-peak charging
- Expanded SDG&E's energy storage capacity to over 50 MW (contracted, installed, and in progress) which represents approximately one third of its energy storage target[7]
- Moved SDG&E's Reduce Your Use (RYU) program from a default to an optional residential program effective May 1, 2014 to improve the effectiveness of the program[8]

Figure 2 - SDG&E's microgrid restored service to many customers during repairs after intense storms on September 6, 2013 in Borrego Springs

[4] "Enterprise" projects are those that meet the broader needs of SDG&E's business but are also related to Smart Grid.

[5] http://www.sdge.com/regulatory-filing/10501/2015-energy-efficiency-program-portfolio-changes-phase1-rulemaking-13-11-005

[6] An exact number of PEVs connected to SDG&E's system is unavailable, as PEV drivers are not obligated to notify the utility, so estimates are compiled from a variety of data sources.

[7] SDG&E's energy storage target set by the CPUC as a result from AB 2514 is 165 MW by 2020.

- Continued engagement and outreach via regular briefings with feedback from key stakeholders across the SDG&E service territory
- Became the first utility and civilian company in the nation to be granted experimental airspace for quad-rotor type Unmanned Aircraft Systems (UAS), which can be used to locate the cause of power outages, conduct inspections of power lines, and access remote areas for improved situational awareness during emergencies through monitoring of fires
- Expanded SDG&E's extensive weather monitoring network to 149 stations, providing greater visibility into microclimate weather conditions for utility operators and public safety agencies, while working with the University of California Los Angeles (UCLA) to implement a weather forecasting system driven by numerical weather prediction to enable statistical correlations between the utility's weather monitoring network and forecasting system, greatly improving accuracy

PROGRESS TOWARD CALIFORNIA'S ENERGY POLICY GOALS

Many California and federal policies underpin SDG&E's *Smart Grid Deployment Plan*, including Senate Bill (SB) 17, the Renewable Portfolio Standard (RPS), Assembly Bill (AB) 32, AB 2514 (Skinner), AB 327 (Perea), the state's distributed generation and demand response goals, the Governor's Clean Energy Jobs Plan, building and appliance efficiency standards, implementation of the electric procurement loading order, and cybersecurity compliance requirements such as the North American Electric Reliability Corporation's Critical Infrastructure Protection (NERC CIP) standards. The majority of Smart Grid projects undertaken by SDG&E are designed to fulfill the utility's role in realizing these goals or complying with mandatory standards.

In 2013, SDG&E made significant progress by procuring 23.6% of electricity deliveries from renewable power sources[9] as it moves toward achieving the state's Renewable Portfolio Standard (RPS) of 33% by 2020. Because of additional renewable generation projects that are reaching commercial operation in 2014, SDG&E expects to reach 33% renewable energy by the end of this year, six years ahead of the state-mandated target. This achievement will be possible due in large part to the construction of the Sunrise Powerlink, a 500-kV transmission line that connects SDG&E's service territory to abundant renewable resources to the east. The need to deliver energy from these clean, yet intermittent sources continues to be a major driving factor in SDG&E's Smart Grid plans, which will integrate renewables, PEVs, and other technologies safely and reliably.

[8] Currently residential customers who sign up to receive alerts are eligible to earn a bill credit when an event is called and they reduce their energy use below their individual target. Since the program launched in 2012, SDG&E has called 12 RYU events to date.

[9] California Public Utilities Commission – "Current Renewable Procurement Status", http://www.cpuc.ca.gov/PUC/energy/Renewables/index.htm.

Figure 3 - Aerial view of Centinela Solar Energy and CSOLAR IC South facilities in Imperial Valley, CA

With the loss of the San Onofre Nuclear Generating Station (SONGS) from the region's power supply and the rapid growth of centralized and distributed renewable generation, the California Independent System Operator (CAISO) and SDG&E face significant technical challenges in managing intermittently available resources while still meeting the needs of customers. For example, CAISO and SDG&E will have to quickly adapt operations of the grid to "ramp up" enough generation resources in the evenings to make up for solar generation that becomes unavailable as the sun goes down. Managing the changes in net load (load minus must take renewables) that occur over hours as well as the changes occurring within seconds will require flexible resources including Smart Grid solutions such as energy storage, dynamic reactive power (VAr) control devices, smart inverters, and advanced control systems that provide operators with strong situational awareness and the ability to quickly respond to problems and rapidly changing system conditions.

STAKEHOLDER ENGAGEMENT

SDG&E continues to work in collaboration with key stakeholders to create the foundation for an innovative, connected, and sustainable energy future and these collaborations have continued to grow in productivity and scope during the past year.

During the Reporting Period, SDG&E's Energy Innovation Center (EIC)[10] hosted 983 events and welcomed more than 31,000 visitors. The Center offers multiple opportunities to learn about energy technologies including HANs, renewable generation, and energy storage systems. External organizations utilizing the Center this past year have included, but are not limited to, the U.S. Department of Energy (DOE), the San Diego Regional Electric Vehicle Infrastructure Working Group, Camp Pendleton, University of California San Diego (UCSD), and the U.S. Green Building Council.

SDG&E has continued its Smart City San Diego collaboration, which that combines resources with the City of San Diego, GE Digital Energy, UCSD and CleanTECH San Diego. This collaboration grew

[10] More information on SDG&E's Energy Innovation Center is at http://sdge.com/eic.

throughout the Reporting Period and continues to make a positive impact on the San Diego region. More information on Smart City San Diego can be found at http://smartcitysd.org.

Electric Vehicle Day 2013 saw the largest gathering of electric cars in the San Diego region's history. More than 750 people attended the event and took 650 test drives in the latest electric drive technology. Local EV drivers had the opportunity to bring their own cars to the event, put them on display, and network with fellow residents interested in driving the cars. SDG&E hosted the event along with Center for Sustainable Energy and the Electric Power Research Institute (EPRI), and provided information on EV rates, incentives, and charging.

Figure 4 - Electric Vehicle Day 2013

On an ongoing basis, SDG&E continues to collaborate with external stakeholders who provided input to its *Smart Grid Deployment Plan*, and who remain engaged with SDG&E on Smart Grid and other issues. These organizations include environmental interest groups, academic organizations, business organizations, municipal utilities and governments, ratepayer advocates, energy non-governmental organizations, large customer/corporate interests, collaborative organizations, and workforce interest groups.

In June 2013, SDG&E joined Pecan Street Inc., a leading national research and development organization in Austin, Texas focused on developing and testing advanced technology, business models, and customer behavior surrounding advanced energy management. SDG&E is working with Pecan Street Inc. on a consumer engagement study. This study, which includes three phases between June and December 2014, surveys 44 customers in a new San Diego housing development that includes many sustainability features. These customers' homes are instrumented with sensors that collect high-resolution data on their energy use, and the customers will be provided with additional tools that will allow them to better view, understand, control, and manage their energy use. Pecan Street will submit a final report to SDG&E after the final data collection date of December 31, 2014.

SDG&E has also continued its collaboration on the Area Situational Awareness for Public Safety Network (ASAPnet), which offers high-speed wireless communications and emergency response capabilities to rural fire stations. This system provides public safety agencies with access to real-time weather data from SDG&E's extensive weather network, as well as access to other resources that will improve those agencies' situational awareness and the ability to better deploy their resources and

maintain public safety through improved communications. This network has recently been expanded to include over 70 fire stations in the SDG&E service area. Further, development continues on nomadic technology that will allow broadband access to both SDG&E and Fire Personnel for Incident Command on an itinerant basis.

SDG&E is actively engaged with manufacturers, the CPUC, and CEC to incorporate advanced functionality in inverters and mandate their adoption in California. The proposed inverters would securely communicate with utility operations systems while also potentially addressing the concerns related to the intermittency of solar generation when coupled with the right tariff incentives. In support of the implementation of smart inverters, SDG&E has worked with the other California IOUs on recommendations submitted to the CPUC through the Rule 21 proceeding[11]. SDG&E is actively working on the next round of activities in response to this rule making via the Smart Inverter Working Group ("SIWG") Phase 2 and 3 recommendations, communications and advanced functionality respectively.

More generally, SDG&E has continued to engage stakeholders across a wide spectrum of Smart Grid issues seeking input and ideas related not just to SDG&E's Smart Grid technology deployment, but the accompanying issues raised, such as customer privacy.

OPPORTUNITIES TO WORK WITH DIVERSE BUSINESS ENTERPRISES

Smart Grid projects represent exciting new initiatives that will bring more opportunities for SDG&E to work together with Diverse Business Enterprises (DBEs) and help the region's communities thrive. From integrating new technology and renewable energy projects that will transform the electric grid into a Smart Grid, many opportunities lie ahead to work with DBEs. These exciting new endeavors will require SDG&E to continue to seek DBE partners in its region with the technological know-how to implement sophisticated networks to continue to strengthen the electric grid and serve the region's communities with reliable and environmentally sustainable energy. In areas where those capabilities are not sufficiently strong, SDG&E works to provide technical assistance and capacity building to grow awareness and capabilities among DBEs wishing to participate in the Smart Grid space.

At the end of 2013, 26.4% of SDG&E's Smart Grid purchases were from DBEs, surpassing its goal of 15%. SDG&E's Smart Grid-related DBE purchases were accomplished through focused efforts that

[11] PG&E, SCE and SDG&E filed a joint motion regarding the implementation of Smart Inverters on July 18, 2014 pursuant to Assigned Commissioner's Amended Scoping Memo and Ruling Requiring the IOUs to File Proposed Revised Electric Tariff Rule 21, dated May 13, 2014 in Rulemaking (R.) 11-09-011.

included DBE requirements in RFPs and identification of qualified DBEs for logistics, warehousing, installation, software, and other products and services.

SDG&E anticipates there will be many opportunities in the coming years for business owners from diverse backgrounds to be a part of this exciting new effort.

OTHER INDUSTRY ENGAGEMENT

SDG&E is represented in several Smart Grid and clean transportation-related industry and advocacy organizations where it provides input on public policy and other industry issues. It is also regularly consulted by the U.S. DOE and other government agencies for participation in research and development peer review and other activities that promote the development of Smart Grid nationwide. For example, Sandia National Laboratories recently requested SDG&E's participation on their Energy and Climate Program Management Unit External Advisory Board.

SDG&E also collaborates with utilities worldwide through its active participation in IBM's Global Intelligent Utility Network Coalition (GIUNC). This international consortium provides SDG&E opportunities to learn about other utilities' solutions to problems that their U.S. counterparts, such as SDG&E, share.

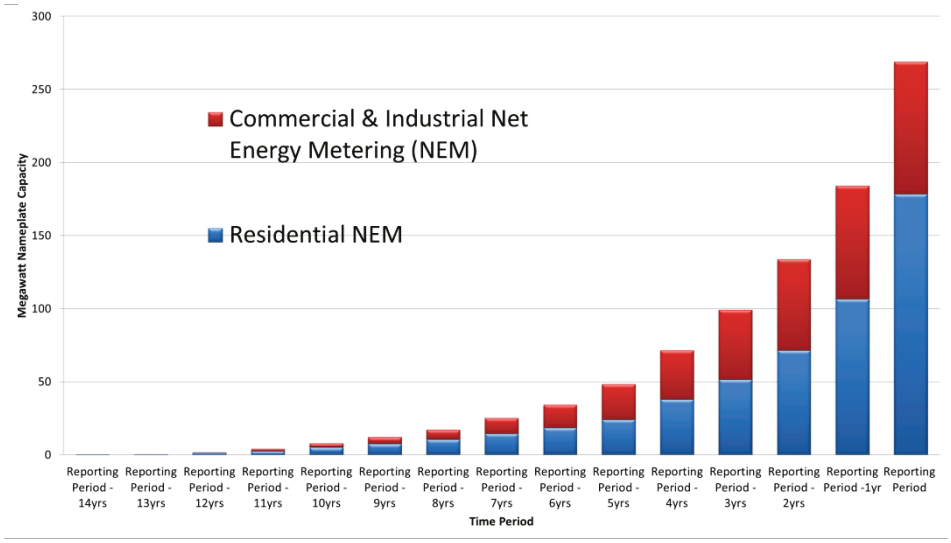
1.1 CUSTOMER DRIVERS

SDG&E is investing in Smart Grid solutions in response to three major customer-driven factors:

- Installation of intermittent distributed (primarily PV) generation systems, which have variable power output and lack compensating controls for grid reliability (such as those that would be found in smart inverters);
- Steady growth rate in the adoption of electric vehicles; and
- Geographic clustering of PV systems and the related disproportionate effects of intermittency and their mitigation requirements.

As shown in Figure 5, SDG&E customers are continuing their investments in distributed generation systems, primarily PV technology, with SDG&E's customers generating nearly 269 MW (peak) from nearly 39,000 systems installed at their premises at the end of the Reporting Period. At a pace that is roughly doubling the installed capacity every two years (in June 2014, 1,302 new PV systems were interconnected, vs. 604 in the same month in 2013); this trend demonstrates the immediacy driving SDG&E's development of Smart Grid solutions that are needed to integrate and manage the quickly growing number of small generators, while maintaining the level of system reliability that customers expect.

Figure 5 - Growth in Net Energy Metered Distributed Generation Capacity of Residential and Commercial and Industrial (C&I) Customers of SDG&E



Distribution circuits where the penetration of PV generation is highest are where many of SDG&E's solutions are focused. Because the intermittent availability of solar generation impacts the distribution system's voltage and other power quality standards, technologies such as energy storage, dynamic voltage controls, distribution synchrophasors, and controllable capacitors have been deployed to areas with power quality concerns to help operators keep the system stable. SDG&E continues to work on

developing the best methods to integrate these devices for effective circuit and grid-level support and are reflecting these in the utility's operational systems and planning and engineering practices.

SDG&E's Smart Grid investments that respond to these customer choices are intended to reliably and efficiently integrate these new technologies. In addition to delivering energy, SDG&E provides standby, power quality, and reliability services to its customers; however, the state's current net energy metering (NEM) rate design results in those customers receiving these services for free, while other customers that have not and may not have the ability to make investments in solar energy systems bear the cost. SDG&E believes that optimal rate design is cost-based, provides accurate price signals, and is fair for all customers, while clearly identifying public policy-driven subsidies. Changes to the current rate design are critical to ensure the continued and sustainable growth of renewable energy resources. SDG&E is deeply involved in collaboration with the CPUC, other stakeholders, and the California legislature to design new rates that can sustain future growth in renewable generation and electric vehicles, in alignment with the state's ambitious energy policy goals.

1.2 CUSTOMER VALUE

Many of SDG&E's Smart Grid projects are being undertaken to create value for customers where the projected benefits outweigh the costs or where the investment is necessary to effectively communicate with customers. The benefits of these customer value-driven and other policy-driven Smart Grid investments are already being realized. For example, SDG&E's Smart Meter deployment now provides residential and small commercial customers with their hourly energy consumption data, viewable online through SDG&E's My Account tool or transferred automatically to other service providers in an industry standard format and protocol. Use of commercially available network gateways allows customers to update their consumption information online nearly instantaneously. Actively managing energy consumption can provide value for customers if coupled with rate design that encourages off-peak energy use. This also promotes operational efficiencies of an interconnected grid, enabling growth in customer- owned renewable generation and electric vehicle charging.

Customer value is also created through environmental benefits related to the integration of distributed energy resources, such as solar power generation, electric vehicles, and demand response. Carbon dioxide equivalent (CO_2e) and particulate emissions associated with conventional generation can be displaced with distributed renewable energy resources, or otherwise avoided through the reliable integration of clean power sources and the use of these sources as a clean transportation fuel.

2 *SMART GRID DEPLOYMENT PLAN* UPDATE

2.1 CHANGES TO THE DEPLOYMENT PLAN RESULTING FROM REGULATORY ACTION OR LEGISLATION

As Smart Grid deployment continues at its rapid pace in the San Diego region, changes in external requirements inevitably mean changes to SDG&E's deployment plan. Table 1: Changes to SDG&E's *SGDP* from Regulatory Action or Legislation discusses those changes resulting from CPUC or other regulatory action or due to developments in state or federal legislation.

Changes reported in previous *Annual Reports* are not repeated here; readers should refer to those earlier reports for that information. SDG&E's previous *Annual Reports* can be retrieved from http://www.sdge.com/smart-grid-deployment-plan.

Table 1: Changes to SDG&E's *SGDP* from Regulatory Action or Legislation

Project	Change from Original *SGDP*	Reason for Change
No changes for this Reporting Period	N/A	N/A

2.2 CHANGES TO SDG&E'S DEPLOYMENT PLAN RESULTING FROM IOU INITIATIVES

Other changes to the *Smart Grid Deployment Plan* are due to new information or understanding of issues, solutions, and market and technology developments, leading to the following changes listed in Table 2: Changes to SDG&E's *SGDP* from Utility Initiatives:

Table 2: Changes to SDG&E's *SGDP* from Utility Initiatives

Project	Change from Original *SGDP*	Reason for Change
Unmanned Aircraft System	Added Project	Evaluating use cases to improve safety, reliability and situational awareness

Project	Change from Original *SGDP*	Reason for Change
Critical Peak Pricing Default (CPP-D) for Medium Commercial Customers	Added Project	Expansion of rate offerings for customers
Vehicle Grid Integration (Part of EV Demand Response project 24)	Added Project	Developed and filed project with the CPUC to expand the availability of EV charging infrastructure for customers with new rates
Vehicle to Home (V2H)	Removed Project	Lack of technology availability / maturity
Smart Substations	Removed Project	Duplicative of capabilities implemented through other projects
Dynamic Reactive Voltage Support Project (Ocotillo Sol)	Removed Project	Needs fulfilled by other projects

2.3 PROJECT UPDATES

2.3.1 PROJECT COSTS

During the Reporting Period, SDG&E estimated expenditures of $114.5 million breakdown in the areas listed in Table 3: Estimated Smart Grid Deployment Costs for the Reporting Period:

Table 3: Estimated Smart Grid Deployment Costs for the Reporting Period

Estimated Spend During the Reporting Period Amounts in Thousands of USD	Reporting Period Value
Customer Empowerment and Engagement	$ 40,708
Distribution Automation and Reliability	$ 28,002
Transmission Automation and Reliability	$ 3,312
Asset Management, Safety and Operational Efficiency	$ 16,215
Security	$ 8,002
Integrated and Cross-Cutting Systems	$ 18,296
Total Estimated Costs	**$ 114,536**

Expenditures are estimated and based on total spend, including operations and maintenance (O&M) and capital, excluding Allowance for Funds Used During Construction (AFUDC), Contribution in Aid of Construction (CIAC) and net of grant-based reimbursements from the California Energy Commission (CEC) and DOE.

2.3.2 ESTIMATED BENEFITS

SDG&E continued using the same comprehensive methodology adopted for its *Smart Grid Deployment Plan* to calculate the estimated benefits for the *Annual Report*. This methodology follows a three-step process, described in Figure 6.

Figure 6 - Estimated Benefits Calculation Process

The framework of this methodology is primarily based on the benefits evaluation model that the EPRI included in the report titled "Methodological Approach for Estimating the Benefits and Costs of Smart Grid Demonstration Projects."[13] SDG&E's methodology includes estimates of economic benefits, reliability benefits based on a Value-of-Service Reliability model developed by the Lawrence Berkeley National Laboratory[14], and environmental and societal benefits based on a model developed by SDG&E in collaboration with the Environmental Defense Fund[15].

When evaluating the benefits of Smart Grid projects, it is important to consider that some of the estimated benefits would be constant and achieved at a normalized rate period over period. These types of benefits includes items such as permanent operational expenses avoided due to the implementation of Smart Grid technologies. However, some other estimated benefits would be cyclical in nature and will not be realized in most cases at a normalized rate period over period.

As with any utility and technology investments, estimated benefits are expected to be realized over the life of the investment, which in nearly all cases is long beyond the time period in which costs are incurred. For example, a particular investment may drive cost for three years, but provide a benefit for as long as the asset is useful, which could be 10 years, 15 years, or even longer. Therefore, it is inappropriate to compare estimated benefits to cost incurred during the Reporting Period due to these time differences. However, some Smart Grid projects with phased implementations such as Smart Meters or Condition-Based Maintenance (CBM) may also accrue benefits during the course of project implementation.

Another aspect to consider when evaluating benefits is that many Smart Grid projects are undertaken to meet requirements and/or energy policy goals. While the specific solutions chosen to meet these mandated requirements and goals will be the least-cost, best-fit response, the quantifiable benefits associated with these solutions may not always exceed their project costs.

Economic benefits are primarily reduced and avoided costs of utility operations. Reliability benefits estimate the societal value of avoided outages for customers among residential, commercial, and industrial classes. Environmental benefits estimate a value of avoided greenhouse gas and particulate emissions, while societal benefits include other costs avoided by customers, such as the avoided cost of gasoline for transportation fuel when electric vehicles are used as alternatives.

[13] Final Report No. 1020342, "Methodological Approach for Estimating the Benefits and Costs of Smart Grid Demonstration Projects", January 2010.
[14] Final Report No. LBNL-2132E, "Estimated Value of Service Reliability for Electric Utility Customers in the United States", June 2009.
[15] For further details on the methodology for environmental and societal benefits see http://docs.cpuc.ca.gov/PublishedDocs/EFILE/RESP/140924.PDF.

During the Reporting Period, SDG&E continued to realize benefits from previously completed projects in addition to new projects that were completed during the Reporting Period. It is important to note that these projects generated benefits not only for SDG&E's operations but also for its customers, the environment, and society in general. Table 4 provides a summary of the estimated benefits identified during the Reporting Period:

Table 4: Estimated Smart Grid Benefits in the Reporting Period[16]

Estimated Benefits During the Reporting Period Amounts in Thousands of USD	Reporting Period Value
Economic Benefits	$ 26,219
Reliability Benefits	$ 12,667
Environmental Benefits	$ 9,136
Societal Benefits	$ 6,052
Total Estimated Benefits	**$ 54,074**

SDG&E's deployment of Smart Meters continued providing benefits during the Reporting Period. The Smart Meter program has achieved relevant reduction and avoidance of operating expenses due to the elimination of a significant portion of meter reading activities and customer services field activities. In addition, the avoided truck rolls due to reduction of meter reading and customer services field activities remained at normalized levels compared to previous period continuing providing environmental benefits to the region. The Smart Meter program also facilitated the implementation of Reduce Your Use (RYU), a Smart Grid Demand Response program. SDG&E's RYU program moved from a default to an optional residential program effective May 1, 2014 to improve the effectiveness of the program. Residential customers who sign up to receive RYU alerts are eligible to earn a bill credit when an event is called and they reduce their energy use below their individual target. Previous studies found that, on average, customers who opted to receive electronic notifications, or alerts, of these peak-time rebate events reduced their electricity usage during RYU event hours by approximately 5.0 to 8.5% of their reference load, which translated into avoided capacity.

The deployment of projects under the Asset Management, Safety and Operational Efficiency program also generated continued economic and reliability benefits. This is in addition to the existing projects in put in service during the Reporting Period. Two key projects now in service are the Geospatial

[16] Environmental benefits calculated based on prices from a report prepared by the California Environmental Protection Agency, *Updated Economic Analysis of California's Climate Change Scoping Plan*, March 24, 2010 and SDG&E's internal forecasts.

Information System (GIS) and Outage Management System/Distribution Management System (OMS/DMS). The OMS/DMS project generated benefits improving the reliability for customers. Existing projects also generated some cyclical benefits. For example, the CBM project, by monitoring the real time condition of transformer health, was able to prevent catastrophic failures thus avoiding replacement of distribution and transmission infrastructure.

During the Reporting Period projects in the area of Distribution Automation and Reliability were completed or in progress providing benefits to customers, markets, and the utility. Customers benefit from the reduction in outage time experienced since devices can be controlled remotely without the requirement of sending field personnel to switch devices. Markets benefit by quickly restoring service and connection to the grid, which allows third parties to continue to deliver grid services. Lastly, the utility benefits since they can avoid sending personnel in the field and incurring operational expenses while improving customer satisfaction. Projects such as the Borrego Springs Microgrid Project, SCADA Expansion, and Wireless Fault Indicators generated these types of benefits through the increase in the use of distribution automation on the grid and improved reliability.

SDG&E also identified environmental benefits during the Reporting Period related to the integration of renewable energy generation resources, both centralized and distributed, which in SDG&E's case are primarily solar power generation. These environmental benefits include an estimation of the avoided emissions reduction associated with displacing conventional generation with distributed renewable energy resources and the integration of centralized renewable energy for compliance with RPS[17]. The avoided emissions reduction for distributed resources is based on the energy load forecast included in the recent California Energy Demand 2014-2024 Forecast prepared by the CEC[18] for solar systems in SDG&E's service territory. In addition, the implementation of the Distribution Interconnection Information System (DIIS) achieved significant improvements in the process for approving roof top solar interconnections. Customers experienced a reduction in the interconnection time with this system while contractors supporting these customers achieved their own savings resulting from an improved workflow process. The integration of over 9,000 electric vehicles into SDG&E's electric grid also generated additional benefits to the environment and the community. SDG&E estimated that the light-duty electric vehicles integrated into the system during the Reporting Period avoided the consumption of approximately 1,500,000 gallons of gasoline. This translates into a positive environmental impact to the region by reducing net emissions, the difference between vehicles

[17] Estimated benefits based on the assumption that the system can accommodate a 20% RPS without Smart Grid technologies.

[18] Form 1.2 – Net Energy Load of the California Energy Demand 2014-2024 Staff Final Forecast – Low Demand Case for SDG&E Planning Area,, File 04 SDGE Low.xls, Form 1.2; retrieved from http://www.energy.ca.gov/2013_energypolicy/documents/demand-forecast/low_case/SDGE_Low.xls

powered by liquid fuels and electricity generation. In addition, electric vehicle owners also benefited from the avoided fuel cost of the gallons of liquid fuels displaced.

2.3.3 PROJECT SUMMARIES AND UPDATES BY PROGRAM AREA

Estimated project costs for the Reporting Period are shown in nominal thousands of dollars.

2.3.3.1 CUSTOMER EMPOWERMENT/ENGAGEMENT

Customer Empowerment/Engagement projects provide customers with readily accessible and reliable information regarding their energy usage. Additionally, projects in this area should help customers gain a better understanding of their energy consumption among their common uses. To further empower customers, price signals must flow to them in a timely and meaningful manner and be integrated into customer energy management and HAN systems.

Generally, projects in this area implement information systems, communication infrastructure, and energy management services along with customer-facing tools, services, and outreach capabilities. Projects included also enable customer-authorized third parties to disseminate important information and educate customers, recognizing that customers often value other sources of information.

Recognizing that smart phone, social media, and tablet usage are increasing among many of the utility's customers, SDG&E must provide the appropriate tools and applications to allow customers to access energy usage data and perhaps other utility provided information. Projects are designed to meet customers' new communications preferences and expectations, and to offer tools that provide customers with relevant information, such as price signals, that result in greater customer awareness of energy impacts. Deploying tools and applications that present valuable customer-specific energy data is a critical component to empowering customers.

Projects that deliver information, services, and control sought by customers and that enable demand response, dissemination of dynamic pricing information, and HAN capabilities are included in this category. Projects included provide customers with transparent and relevant price signals and enable utility and non-utility service providers to offer products and services that provide customer value.

COMPLETED PROJECTS

Project 1: Smart Meters	
Funding Source: Smart Meter Decision (D.12-04-019) **Project Timeframe: 4/2007 to 12/2015**[19]	Reporting Period Estimated Costs: $19,787
Description: The SDG&E Smart Meter project was approved by the CPUC in D.07-04-043 in April 2007. Smart electric meters are solid state, digital devices that record energy usage data and, unlike traditional meters, transmit and receive data. Smart Meters record hourly electric consumption for residential customers and 15-minute consumption for commercial customers. Daily consumption is recorded for natural gas usage.	
Update: As of June 30, 2014, SDG&E's current population of Smart Meters is approximately 2,291,000 electric and gas endpoints in the service territory. The number of endpoints being billed from Smart Meter reads is approximately 2,288,000 (more than 99.8% of the available endpoints). The number of Smart Meters remaining to be deployed is approximately 1,800, not including meters of customers whom have elected to opt-out of wireless Smart Meters. The Smart Meter project has continued to realize its business case benefits and incorporated these operating benefits as reductions in the recent 2012 general rate case (GRC). Operational benefits include meter reading reductions, customer service field reductions, reduced customer outage calls, automated outage analysis, crew deployment improvements, emergency and planned switching support, advanced metering operations reduced maintenance, reduction in fleet vehicles, and billing area benefits. SDG&E received the opt-out final decision (Phase I) on April 19, 2012 (D.12-04-019). This decision established the alternative solution and fees for residential customers until a final decision on cost and cost allocation gets established via the opt-out Phase II regulatory proceeding. As of June 30, 2014, there are 2,502 residential customers who have selected this option. The proposed decision for Phase 2 is still pending.	

[19] While the Smart Meter project is materially complete, D.11-03-042 (March 2011) approves SDG&E's Petition for Modification of D.07-04-043 (approving SDG&E's Smart Meter deployment) to allow project costs to be recorded in the Advanced Metering Infrastructure Balancing Account (AMIBA) until such time as deployment of its AMI system is fully complete.

Project 2: PEV Rate Experiment (Study)	
Funding Source: GRC **Project Timeframe: Ongoing**	Reporting Period Estimated Costs: <$100

Description: The objective of this project is to examine PEV consumer TOU charging preferences, the use of smart-charging enabling technology, and other relevant factors through a study that includes the use of CPUC approved experimental PEV rates[20]. SDG&E is conducting this research in collaboration with ECOtality's EV Project and Nissan during the introduction of the Leaf PEV to the greater San Diego region, which began in December 2010. This study will examine the price elasticity of demand for electricity by time-of-day among PEV vehicle consumers as an indicator of the sensitivity of electricity demanded to its change in price.

Update:

The Final Report was published 4/10/2014, it was served to parties of the Alternative Fuel Vehicle(AFV) OIR (R.09-08-009).Key finding of the final report are:

- Participant EV charging takes place mostly during the super off-peak period using charging timers.
- Participant EV charging exhibit learning behaviors.
- Participant EV charging behavior responds to price signals.
- EV customers are most responsive to changes in on-peak and off-peak prices.

The first year evaluation report was completed in December 2012. The preliminary report was attached to a joint IOU Load Research and Cost Tracking compliance filings with the CPUC as part of the AFV OIR.

[20] For information on the temporary experimental PEV rates EPEV-X, EPEV-Y and EPEV-Z see http://www.sdge.com/electric-tariff-book-residential-rates.

PROPOSED / PLANNED PROJECTS

Project 3: Centralized Calculation Engine	
Funding Source: GRC **Project Timeframe: Planned to begin in 2015**	Reporting Period Estimated Costs: $0
Description: The development of a centralized calculation engine which will incorporate data multiple data sources and provide price and cost calculations as output. The calculation engine will be flexible and all comprehensive rate, price, and cost modeling, as well as the ability to manipulate curved, types of charges (consumption, demand, fixed, etc.) peak moves, event hour shifts, and more. It will ensure consistency of calculations and output across many operations and users.	
Update: Evaluating vendor solutions and implementation approaches.	

IN-PROGRESS PROJECTS

Project 4: Connected…to the Sun	
Funding Source: Application (A.12-01-008) **Project Timeframe: Upon approval**	Reporting Period Estimated Costs: <$100
Description: In January 2012, SDG&E filed an application with the CPUC for a pilot program called "*Connected…..to the Sun*," which will give all SDG&E customers two options to buy solar power, even if they do not own a home, cannot afford the upfront cost of solar, or do not have the ability to put PV panels on their roof. Customers could "lock in" their solar energy cost and take solar service with them if they relocate within SDG&E's service area. A brief overview of the two solar options are as follows: 1. *Share the Sun* a. Solar provider constructs projects in San Diego for purchase by SDG&E customers b. Customers purchase energy rights from a participating solar provider c. Customers receive solar energy and a credit on their monthly bill from SDG&E 2. SunRate℠ a. SDG&E sets aside local solar projects under contract for customers b. Customers can subscribe to pay the SunRate price for 50%, 75%, or 100% of their	

Project 4: Connected…to the Sun	
electricity use c. Customers receive solar energy from SDG&E	
Update: SDG&E's Connected.....to the Sun application has moved beyond the testimony and briefing phases of the proceeding and is now awaiting CPUC decision.	

Project 5: Green Button Connect My Data	
Funding Source: GRC **Project Timeframe: 2012 - Ongoing**	Reporting Period Estimated Costs: <$100
Description: Green Button Connect My Data is the automated sending of Green Button data to third parties (per customer request/consent) via a standard interface (NAESB/ESPI). Customers' data will be sent using one of two models: One and done (one-time data transmission of up to 13 months of customer consumption depending on customer data availability) and ongoing (customer data to be transmitted on an ongoing basis as long as customer is enrolled with third party).	
Update: As of June 30, 2014, there are a total of 16 tools available for customers to authorize sharing of energy usage data via automation, of which 12 are for residential-use and four are for commercial and industrial use. Future enhancements to comply with mandates are in the planning stages.	

Project 6: Smart Grid Demand Response Programs	
Funding Source: Application (A.11-03-002) **Project Timeframe: 1/2013 – 12/2014**	Reporting Period Estimated Costs: $204
Description: Smart Grid related demand response programs are a subset of the programs included in SDG&E's demand response application (A.11-03-002) filed on March 1, 2011. Specifically, these include SDG&E's RYU program (referred to as 'Peak Time Rebate' [PTR] in	

Project 6: Smart Grid Demand Response Programs	
A.11-03-002) and new construction programs (NCDRP).	
Update: On April 19, 2012, the CPUC issued decision (D.)12-04-045 adopting demand response activities and budgets for all three IOUs for 2012-2014 and in this decision SDG&E was granted an overall budget of ~$65.8 million. For the programs specifically designated as Smart Grid (PTR and NCDRP), SDG&E received ~$11.1 million. Beginning in May 2014, RYU was changed to an opt-in program. There were four RYU events called during this Reporting Period. The primary overall finding is that, on average, only customers who opted to receive electronic notifications, or alerts, of events reduced their electricity usage during RYU event hours by approximately 5.0% to 8.5% of their reference load. NCDRP has been delayed but intends on evaluating one or two projects each from residential and/or commercial by the end of 2014.	

Project 7: Electric Vehicle (Clean Transportation) Education and Outreach	
Funding Source: GRC **Project Timeframe: Ongoing requirement, per the CPUC**[21]	Reporting Period Estimated Costs: $650
Description: The objective of this project is to provide educational outreach to all customers and electric transportation stakeholders through various means (printed and digital/online collateral, website, web tools, call center, utility-hosted seminars), at SDG&E's Energy Innovation Center, community events, in-person meetings, and training on the following topics: Rates, metering, and billing analysis (service choices), safety and reliability, line extension rules, Basic information about PEVs, information resources, PEV supply equipment, and support services, and Environmental and financial benefits (AB32, off-peak charging). In addition to addressing the information needs of SDG&E customers and various PEV	

[21] D.11-07-029

Project 7: Electric Vehicle (Clean Transportation) Education and Outreach	
stakeholders, the overarching outcome of these education and outreach efforts (as well as the projects listed below) leads to broader PEV market developmental and support.	
Update: SDG&E participated in numerous outreach events over the last year and completed an online EV Rate Education Campaign where SDG&E saw the highest increase in EV rate adoption. Additionally, there are now more than 65 employees driving EVs partially due to SDG&E employee communication efforts that post testimonials from employee EV drivers on the company's internal website Power Up. PEV education and outreach highlights: SDG&E joined with the Center for Sustainable Energy, Plug-in America, Plug-in 2013 Conference and the Sierra Club to host the region's first Electric Vehicle Day as part of National Plug-in Day. San Diego saw the largest gathering of electric vehicles in its history – 750 attendees took 650 ride-and-drives in electric cars. The second Electric Vehicle Day was hosted on Sept. 20, 2014. SDG&E strives to be a leader in workplace EV charging with its plan to install more than 100 charging stations at SDG&E facilities by year-end. The utility continues to educate business customers about the utility's one-of-a-kind wireless charging demonstration project. Impactful events included the LGBT "Drive Your Values" EV ride-and-drive and panel discussion; an Earth Fair EV Car show hosted for 1,000 employees; and the annual San Diego Earth Fair EV Car Show at Balboa Park that saw more than 1,000 attendees. Smart City San Diego agreed to a fourth year of focusing the collaborative' s efforts on increasing the adoption of EVs in the region. The 9th Annual SDG&E Energy Showcase and EV Expo was hosted for fleet and business customers and the largest amount of fleet and passenger vehicles in the events history helped draw more than 600 attendees.	

Project 8: Demand Response Management System (DRMS)	
Funding Source: GRC and Smart Meter Decision (D.12-04-019) **Project Timeframes: 8/2010 and ongoing**	Reporting Period Estimated Costs: <$100

Demand Response Management System (DRMS) (formerly known as Demand Response Control Application) – The DRMS Project will enable the management of SDG&E's entire demand response portfolio with the following integrated capabilities: program management, enrollment, eligibility, device management, event management, forecasting, settlement, analytics/reporting and workflow. The full project implementation will take 2 – 3 years to complete with a phased approach. The first phase will implement functionality necessary to retire a high-cost application, automate manual processes for ongoing benefits and provide the functionality needed to send text messaging, two-way DR load control and price signals to meter-connected HAN device and finally allowing the monitoring of device connectivity. The subsequent phases will cover the rest of the portfolio of DR programs and add the additional integrations necessary for an enterprise solution.

HAN Retail Enablement – Per CPUC Resolution E-4527 – HAN Implementation Plan, CPUC orders the CA IOU's to enable a retail market for HAN.

Small/Medium Business Thermostat Deployment – The advanced metering infrastructure (AMI) project included scope and funding to install demand response enabled thermostats at small and medium businesses for peak load reduction. Smart meter interval data has been used to pre-qualify a target list of customers. This deployment has been aligned with the Premium Cooling and Efficiency Program and Direct Install Program in order to leverage existing contractors at customer sites to promote the offer and recruit customers along with providing the installation services for a complete Integrated Demand Side Management (IDSM) solution.

Updates:

DRMS: Competitive bids from an RFP were received and are under review.

HAN Retail Enablement: As of June 30, 2014 a total of 590 customer requests have been received to connect a HAN device. Eleven HAN devices have been validated for compatibility and security with the Smart Meters and published on the SDG&E HAN website.[22]

[22] More information can be found at www.sdge.com/han.

Project 8: Demand Response Management System (DRMS)	
Small/Medium Business Thermostat Deployment – A field test was completed in October 2013 resulting in successful installation of 18 thermostats and confirmed DR signaling via Wi-Fi. Phase 1 of this project was completed in Q1 2014 with the Premium Efficiency Cooling Program completing 400 installations. As of June 30, 2014 a total of 2,380 thermostats have been installed with 290 business customers.	

Project 9: Smart Pricing Program (Dynamic Pricing)	
Funding Source: Application (A.10-07-009) **Project Timeframe: 9/2010 to 12/2015**	Reporting Period Estimated Costs: $15,093
Description: SDG&E's Smart Pricing Program was proposed via application A.10-07-009 filed on July 6, 2010 and modified as described in the Joint Party Settlement Agreement filed on June 20, 2011. The application and Settlement Agreement describe SDG&E's plans to implement TOU and dynamic rates for residential and small business customers, along with the system upgrades and customer outreach and education efforts necessary to successfully transition SDG&E's electric customers to smart pricing. On Dec. 12, 2012, the CPUC adopted D.12-12-004 approving TOU and dynamic rates for SDG&E's residential and small business customers.	
Update: New Smart Pricing rate plans (Time of Use and Time of Use Plus) along with online rate comparison and rate enrollment tools became available on May 1, 2014 for small business customers. As of August 21, 2014, there were more than 1,900 customers enrolled in these plans, of which about 1,200 are enrolled in the TOU Plus plan, which contains a critical peak pricing component. Marketing efforts are planned to ramp up in the fall for small business customers. Time of Use and Time of Use Plus rate plans should be available for residential customers in 2015. Additionally, a spending alert, usage alert and tier alert is now optionally available to customers. Customer energy alert subscriptions have exceeded 65,000.	

Project 10: Smart Meter Operations Center	
Funding Source: GRC **Project Timeframe:** 7/2013 to 6/2014	Reporting Period Estimated Costs: $3,409
Description: The Smart Meter operations center, network monitoring, and visualization project will provide the tools to determine system status and availability of network devices (meter endpoints). The Smart Meter network monitoring and visualization project is proposed as a precursor to a separately proposed, larger effort for applied data analytics, exception management, asset management, and predictive modeling.	
Update: A project plan was developed because of an extensive effort comprised of product analysis, strategies, and collaboration with utilities across the U.S. and Canada that are also involved in Smart Meter deployment and technology improvements. Based on these collaborations, system architecture, a formal plan was approved that focused on big data management and an implementation of advanced analytics designed to identify communication exceptions within the Smart Meter network.	

Project 11: Critical Peak Pricing Default (CPP-D) for Medium Commercial Customers	
Funding Source: GRC **Project Timeframe**: **10/2013 and ongoing**	Reporting Period Estimated Costs: $1,241
Description: In 2008, SDG&E rolled out CPP-D as the first dynamic rate to the large commercial and industrial (C&I) segment (~1,700 customers). The Smart Pricing Program is rolling out dynamic rates for the residential and small C&I customer segments, leaving the medium C&I customer segment without rate options. The project scope includes the following: • Automating business processes such as: rate eligibility, enrollment and dis-enrollment (opt-out), anniversary management, DR event day management, event day notifications, post-event analytics, marketing, and reporting and metrics. • Providing services to the customers via online tools for viewing their usage, meter data, cost	

Project 11: Critical Peak Pricing Default (CPP-D) for Medium Commercial Customers	
of usage (including CPP-D events), running rate comparisons between other applicable rates, choosing a capacity reservation charge (CRC), and electronic dis-enrollment. • Functionality for group bill, such as viewing, paying, payment processing, accessing historical group bills, downloading, printing, and paperless options. • Integrating eligibility, enrollment, dis-enrollment, notifications, rate comparison, CRC election, and group bill pay with My Account through Web Center	
Update: During this reporting period the project kicked off and the CPP-D team was established. The team completed RFP evaluations and selected preferred professional services vendors for integration and programming work as well as finalized an agreement with the preferred customer facing analytics and presentation provider.	

ENTERPRISE PROJECTS

Project 12: Digital Roadmap • **SDGE.com Website** • **eServices/My Account**	
Funding Source: GRC **Project Timeframe: Ongoing**	
Description: The digital roadmap provides for six initiatives that supply customers with greater accessibility to information and easier navigation for more effective communications and time savings in addressing customer energy-related information needs: (a) Re-architecting My Account website; (b) eServices; (c) digital research; (d) including social media into two-way communications; (e) digital advertising; and (f) mobile applications.	
Updates: **SDGE.com Website:** This year the project team focused on improving the user experience which included items such as making sure customers understand how to interact with SDGE.com. Like My Account, SDGE.com also went under an accessibility overhaul to comply	

Project 12: Digital Roadmap • **SDGE.com Website** • **eServices/My Account**	
with the TY 2008 GRC Memorandum of Understanding (MOU) with the Disability Rights Advocates that will ensure people with disabilities can use the website as it is intended. **eServices/My Account:** The purpose of the My Account Accessibility Usability Improvement (MAAUI) project is to update the customer-facing My Account portal site to comply with TY 2008 GRC MOU with the Disability Rights Advocates while improving usability and upgrading the portal technology platform. Updating the My Account portal site's user interface will enhance customer experience through improved visual layout, additional personalization.	

Project 13: Community and Stakeholder Engagement • **Energy Innovation Center (EIC)** • **Pecan Street Inc.**	
Funding Source: Various **Project Timeframe: Ongoing**	
Description: SDG&E's community and stakeholder engagement effort is intended to provide campaign-level coordination in the utility's engagement effort and ensure that the overarching connections between programmatic outreach and education efforts are present. Encompassed in this effort is a wide variety of stakeholder-focused efforts, all significantly associated with Smart Grid and specifically SDG&E's Smart Grid efforts. SDG&E has actively worked with business association and residential groups to educate them on the changing landscape of the energy industry. After the Smart Meter deployment education effort, SDG&E recognized the need to continue community and business outreach on energy issues. SDG&E is working hard to ensure its stakeholders – in particular, customers – look to SDG&E as a trusted energy advisor.	
Updates: **Energy Innovation Center (EIC):** The Energy Innovation Center opened in January 2012 with the mission to help San Diego achieve its energy efficiency (EE) potential. The mission includes educating businesses and residents, encouraging the adoption of EE technologies and training San Diego's workforce to install, operate, and maintain EE projects. On February 24th, The EIC	

Project 13: Community and Stakeholder Engagement • **Energy Innovation Center (EIC)** • **Pecan Street Inc.**	
received the "double-platinum" LEED® certification status from the U.S. Green Building Council. It is the first building in San Diego and third in California to receive this certification.[23] **Pecan Street Inc.**: In June of 2013, SDG&E joined Pecan Street Inc., a leading national research and development organization in Austin, Texas focused on developing and testing advanced technology, business models, and customer behavior surrounding advanced energy management. SDG&E is working with Pecan Street Inc. on a consumer engagement study to take place in three phases between June and December 2014, on 44 customers in a new San Diego housing development that includes many sustainability features. These customers' homes are instrumented with sensors that collect high resolution data on their energy use, and the customers will be provided with additional tools that will allow them to better understand and manage their energy use. Pecan Street will submit a final report to SDG&E after the final data collection date of December 31, 2014.	

[23] http://www.sdge.com/newsroom/press-releases/2014-02-24/sdge%E2%80%99s-energy-innovation-center-achieves-double-platinum-leed

2.3.3.2 DISTRIBUTION AUTOMATION AND RELIABILITY

Distribution Automation/Reliability (DAR) includes projects which improve SDG&E's information and control capabilities for distribution systems. These capabilities may be used to address the complexities associated with integrating distributed energy resources and electric vehicles, advanced outage management, and/or Volt/VAr control. DAR will provide the ability to safely and reliably incorporate high penetrations of distributed energy resources by mitigating voltage fluctuations resulting from intermittent power generation. DAR projects will also provide the ability to safely and reliably incorporate the increasing load of charging EVs. DAR will detect and isolate faults when they occur, immediately restore service to customers, and provide information about outages in real-time. Self-healing circuits will reduce the number of customers affected by sustained system disturbances and will enable faster service restoration. DAR will also provide optimization of voltage and reactive power on the system to enhance power quality and decrease energy consumption, including system losses.

DAR helps enable electricity markets to flourish and helps deliver a Smart Grid that has the infrastructure and policies necessary to enable and support the integration of demand response, energy efficiency, distributed generation, and energy storage into energy markets.

COMPLETED PROJECTS

Project 14: Dynamic Voltage Control	
Funding Source: GRC **Project Timeframe: Complete**	Reporting Period Estimated Costs: $441
Description: The objective of this project is to perform an engineering study of a circuit with 40+% PV generation to determine the impact of voltage compensating equipment. This project will install voltage compensating equipment, monitor circuit performance, and assess the impact of the equipment. Two types of installation will occur, a 240 kVAR installation for distributed dispatch and a 2 MVAR installation for a more concentrated approach.	
Update: The 240kVAR installation was completed and has performed very well. The 2 MVAR installation has been difficult to fine tune due to communication issues plaguing it based on its remote location. The communication system is essential to effectively implement solutions to the other obstacles however; third party coverage in the area is not available.	

PROPOSED/PLANNED PROJECTS

Project 15: Solar Energy Project	
Funding Source: Application (A.08-07-017) **Project Timeframe: 2008 to 4/2016**	Reporting Period Estimated Costs: $917
Description: The 100 MW_{dc} solar energy project, which CPUC approved in 2010, includes a program to develop as many as 26 MW_{dc} of utility-owned solar generation and 74 MW_{dc} of merchant-owned generation that was to be delivered via power purchase agreements. The 74 MW_{dc} portion has since been added to the 80 MW Renewable Auction Mechanism Feed-in Tariff (RAM-FiT) program. The utility-owned portion of the program calls for SDG&E to install multiple PV systems, as large as 5 MW on SDG&E's distribution system. SDG&E anticipates employing smarter inverters, like those advocated by the Western Electric Industry Leaders, at these sites with the specific capabilities dependent upon local grid needs and size of the PV installation. The successful bidder bid eight projects to be built on existing Utility owned property for a total of 17 MWdc. All but three projects have been eliminated due to financial constraints uncovered during detailed site screening.	
Update: The three remaining projects, totaling 8.6 MW dc, are in various stages of the County permitting process. Construction is expected to begin Q2 2015. The projects are slated to be completed by Q2 2016 consistent with the CPUC decision which limits the program to 5 years from April 2011.	

IN-PROGRESS PROJECTS

Project 16: Advanced Energy Storage (AES) – Distribution	
Funding Source: GRC **Project Timeframe: 10/2011 and ongoing**	Reporting Period Estimated Costs: $12,143
Description: The objective of this project is to install advanced energy storage projects that will mitigate the impact of intermittent renewables and provide SDG&E with experience developing, implementing, and operating new energy storage technologies. The scope will include developing utility scale (300 kW+) energy storage units at substations and other locations, and distributed energy storage systems (DESS - typically 25 to 50 kW) on distribution	

Project 16: Advanced Energy Storage (AES) – Distribution	
feeders. DESS are also known as Community Energy Storage (CES) systems.	
Update: Since the last report, the AES project installed one 1,000 kW/3,000 kWh system designed to mitigate renewable resources impact at a substation, as well as providing islanding capabilities in the event of a grid outage. Additionally, the project from its inception, has installed and operated three CES units, totaling 75 kW/216 kWh, at various locations around the service territory. In addition, a 500kW/1500kWh system is in operation at an SDG&E substation. SDG&E has also constructed or begun construction on four new systems totaling more than 4 MW/11 MWh to be installed through the end of 2014 and into 2015. These systems will be used for renewable resource intermittency mitigation, peak shaving, overload mitigation, reactive power dispatch, and islanding, in support of microgrids, as well as other benefits depending upon size, location, and the conditions of the circuits to which they are connected.	

Project 17: Dynamic Line Ratings – Distribution	
Funding Source: GRC **Project Timeframe: 9/2012 and ongoing**	Reporting Period Estimated Costs: <$100K
Description: This project installs sensors on distribution lines to monitor tension and temperature conditions in order to develop real time dynamic conductor ratings. With this technology as part of a portfolio of projects, increased amounts of renewable generation can be integrated into the grid.	
Update: During the Reporting Period, designs were submitted for review of permitting, land management and traffic control.	

Project 18: Borrego Springs Microgrid	
Funding Source: DOE, CEC and GRC **Project Timeframe: 04/2014 – 12/2016**	Reporting Period Estimated Costs: $2,155

Description: The objective of this project is to establish a microgrid demonstration at an existing substation to prove the effectiveness of integrating multiple Distributed Energy Resources (DER) technologies, energy storage, feeder automation system technologies, and OMS with advanced controls and communication systems, for the purposes of improving reliability and affecting feeder/substation capacity in normal and outage/event conditions. This project was performed in partnership with the DOE and CEC.

Borrego Springs Microgrid 2.0 will enhance the existing Borrego Springs Microgrid, by increasing operational flexibility and automation to better respond to a variety of potential outage situations, and leverage various new technologies and Resources for increased microgrid capabilities.

Update: During the Reporting Period, the project team completed a number of activities:

Borrego Springs Microgrid

- DOE and CEC required demonstrations were conducted utilizing all components (Substation Energy Storage, Community Energy Storage, Distributed Generation and Price-Driven Load Management) of the microgrid.
- Conducted seven planned “island” events in which the microgrid circuit was separated from the grid and operated independently with only local resources to support customer load
- Resulting DOE and CEC reports were submitted.
- In August of 2013, Borrego Springs was struck by some flash floods which disrupted power to the microgrid circuit with the community energy storage (CES) units. These three units islanded the six customers connected to them for ~ 5.5 hours while repairs were made to the distribution system.
- On September 6, 2013, severe thunderstorms struck the Borrego Springs area resulting in the destruction of 9 transmission and 11 distribution poles as well as the closing of all roads into/out of Borrego Springs due to flooding. All power to Borrego Springs was lost at 1420. Once roads were cleared and crews were able to reach Borrego Springs the inspection/repair process began. The microgrid was once again used to blackstart the community and pick up load as crews were able to validate the safety of the system. The microgrid provided power for up to 1,056 customers including cool zones and key municipal resources for > 20 hours while crews worked around-the-clock to make

Project 18: Borrego Springs Microgrid	
repairs. Borrego Springs 2.0 • Designs for equipment installations and upgrades are being finalized • Upgrades and retrofits to new protection automation controllers complete • Development and testing concurrently ongoing for new microgrid resource manager software • Vendors have been selected for associated scopes of work • Installation of new equipment has started • Finalizing technical requirements for integrating and increasing microgrid load capacity	

Project 19: Phasor Measurement Units (PMU) – Distribution	
Funding Source: GRC **Project Timeframe: 6/2012 and ongoing**	Reporting Period Estimated Costs: $3,024
Description: The project is installing synchrophasor equipment (Phasor Measurement Units, or PMU) at key locations to enhance the safety, efficiency, operability, and reliability of the distribution system. PMUs are advanced grid monitoring technologies that rely on high speed, time-synchronized, analog, and digital measurements. Phasor measurement technologies are needed for understanding potential problems with the grid and are a key component of a tightly controlled, stable, self-healing grid. Specific benefits: • Mitigating negative effects of distributed renewables (PV/Wind) • Monitoring and visualization for operations and engineering • Improved distribution system control and protection • Power system restoration	
Update: This project performed a multitude of activities during the Reporting Period including: • Completed four test cycles utilizing Real Time Distribution Simulator (RTDS) • Finalized engineering design for seven circuits across four substations • Completed installation of 25% of circuit/pole installed Advanced SCADA devices • Completed installation of Advanced SCADA device hardware at (2) substations • Completed standards documentation for methods and procedures for new hardware	

Project 19: Phasor Measurement Units (PMU) – Distribution	
standards • Developed 60+ use cases for Advanced SCADA devices	

Project 20: Sustainable Communities Programs	
Funding Source: GRC **Project Timeframe: Concluding 12/2015**	Reporting Period Estimated Costs: $1,501
Description: This is a set of projects that aim to advance and promote the use of clean distributed energy resources (DER) –such as solar PV, fuel cells, and energy storage—by integrating DER into the electric distribution system. These projects focus on reducing energy demand and integrating clean energy systems while encouraging sustainably designed buildings and communities.	
Update: **Civita**: The team is working on the detailed design for a microgrid at an apartment building, which will include solar PV and battery energy storage (utility-owned), as well as demand management for customer load. The DER will support some of the customer's priority load in the apartment building in the event of a grid outage. Project completion is targeted for Q1 2015. Contract negotiations with the developer are expected to be finalized by the end of Q3 2014. **Del Lago Academy:** The project consists of a 170 kW PV system and an integrated 100 kW/200 kWh Advanced Energy Storage System. The system was energized on December 20, 2013. **Del Lago Park N Ride:** The project consists of a 13 kW PV carport, 4 Level 2 EV charging stations, one Fast DC EV charging station, and the infrastructure for an Advanced Energy Storage System. The system was energized on March 6, 2014. The Advanced Energy Storage System will be installed in 2014 under the SDG&E OPRA project. **Agua Hedionda Nature Center:** The project consists of a 5 kW PV system. The system was energized on March 28, 2014.	

Project 21: Supervisory Control and Data Acquisition (SCADA) Capacitors	
Funding Source: GRC **Project Timeframe: 3/2011 and ongoing**	Reporting Period Estimated Costs: $4,089
Description: The objective of this project is to convert existing distribution line capacitors to SCADA control in order to provide improved VAr control and improved system efficiency and operability. SCADA controls will also alert utility personnel of operating issues. This will increase capacitor bank reliability, minimize downtime, and expedite repair work. Once fully implemented, the annual capacitor survey will be eliminated as a result of this project.	
Update: Between July 1, 2013 and June 30, 2014, 81 new 12 kV SCADA capacitors were installed and energized to replace 81 older overhead and pad-mounted non-SCADA capacitors. As of June 30, 2013 there were 31 SCADA capacitors in various levels of construction and a total of 50 jobs pending final permits or ready to be issued.	

Project 22: SCADA Expansion – Distribution	
Funding Source: GRC **Project Timeframe: 1/2012 and ongoing**	Reporting Period Estimated Costs: $764
Description: This project will install 300 SCADA line switches to promote a minimum of 1.5 switches on every distribution circuit (mid-points and ties). This project will also install SCADA at 13 legacy (existing) substations. With the completion of this project, automation will be operative for a significant portion of a circuit following an outage.	
Update: As of June 30 2014, SCADA line switches continue to be installed and one substation is fully completed.	

Project 23: Wireless Faulted Circuit Indicators	
Funding Source: GRC **Project Timeframe: 9/2011 and ongoing**	Reporting Period Estimated Costs: $221
Description: The objective of this project is to install as many as 10,000 wireless fault indicators (WFI) devices on the overhead and underground electric distribution system. In the event of a circuit fault, WFIs rapidly transmit fault location data via secure wireless communication to the Distribution Control Center. This information allows distribution operations personnel to direct electric troubleshooters more efficiently, minimizing customer outage time and expediting repair work. The same devices provide a secondary benefit, reporting load data once a day in one hour increments, for system planning and operating use.	
Update: During the Reporting Period, the project team has installed roughly 120 overhead wireless fault indicators to a total nearing 3,020. The team integrated 700 of the generation 2 units into GIS and OMS/DMS, providing visual indication of faults directly to system operators. This project has provided benefits by reducing outage times and shortening patrols for faults. The team has also completed 20 underground units. Future plans will add pressure sensors into the device to indicate water level in manholes and other substructures subject to water intrusions as well as improve accuracy of load data.	

Project 24: EV Demand Response • **Grid to Vehicle (G2V)** • **Vehicle to Grid (V2G)** • **Vehicle Grid Integration (VGI)**	
Funding Source: GRC **Project Timeframe: 9/2011 and ongoing**	Reporting Period Estimated Costs: $0
Description: SDG&E commenced implementation of the first of its kind EV Smart Charging system for shared parking areas in the workplace. The system to serves its employees, and PEV fleet, and provides a real-world demonstration for customers interested in learning more about workplace and multi-unit dwelling charging solutions for shared parking areas. This facility features a centralized charge control kiosk, smart-phone application and web site for capturing employee-charging decisions based on various time-of-day pricing options. This project allows	

Project 24: EV Demand Response • **Grid to Vehicle (G2V)** • **Vehicle to Grid (V2G)** • **Vehicle Grid Integration (VGI)**	
SDG&E to experiment with enabling technology and behavioral response to greater increases in the range of variable day-ahead pricing based on CAISO market prices and, relatively high-load periods nearby and across California's electric system. This SDG&E workplace system will also be used to test DR applications, incorporated DR functional requirements, along with hourly pricing features, with the planning already underway to build a PV shaded parking canopy at SDG&E's headquarters facility. The installation includes eight parking spaces equipped with Level 1 (1.4 kW, 120-volt) vehicle charging, and two additional spaces equipped with Level 2 (6.6 kW, 240-volt) vehicle charging. These cooperative efforts to build the facility to accomplish the following: • Provide a platform for demonstrating employees' response to time-variant pricing • Demonstrate the utility of Level 1 charging for the workplace and fleet • Demonstrate remote charging shut-off and/or load control • Develop cost-effective access control and billing systems for potential use at SDG&E facilities for employee charging (adaptable to customer workplace and multi-unit dwelling settings)	
Update: Early in Q4 2013, static TOU pricing was replaced with an initial design and implementation of hourly pricing made up of CAISO market prices and retail price components typical of other utility tariffs. In late Q1 2014, a new user pricing-preference application - for iOS and Android based cell phones - was deployed for initial beta testing. Testing and refinement of the phone application, and interactions between phone application and the central charging system/back office, are ongoing. In April of 2014, SDG&E filed an application (A.14-04-14) to conduct a Vehicle-Grid Integration Pilot Program that includes a day-ahead variable rate along with enabling charging equipment at workplace and multi-family communities.	

Project 25: Distributed Energy Resource Management Solution	
Funding Source: GRC **Project Timeframe: 04/2013 to 06/2016**	Reporting Period Estimated Costs: $2,736

Description:

The purpose of the Distributed Energy Resource Management Solution (DERMS) project is to develop a software solution to monitor, control, and optimize distributed energy resources.

- Integrates and aggregates batteries, fuel cells, solar, generators, and other distributed energy resources for reliability, economic, and market participation
- Uses load forecasting, day-ahead price signals, DRMS, etc. to give multiple options for optimization and scenario-based operations
- Integrates with DMS, GIS, DRMS, etc.

Update: At the time of this report, the project team has selected its preferred vendor, signed a contract, and started work towards developing DERMS applications. The first DERMS application has been delivered to SDG&E for testing in the lab.

2.3.3.3 TRANSMISSION AUTOMATION AND RELIABILITY

Transmission Automation/Reliability (TAR) includes projects that would provide wide-area monitoring, protection and control to enhance the resiliency of the transmission system. TAR also includes projects to provide the ability to safely and reliably incorporate utility size intermittent power generation, such as centralized solar and wind energy. TAR projects would mitigate voltage fluctuations resulting from integrating intermittent resources.

The wide-area capabilities of TAR would provide the ability to monitor bulk power system conditions, including but not limited to voltage, current, frequency, and phase angle, across SDG&E's geographic area in near real-time. This functionality provides system operators with current information about emerging threats to transmission system stability, enabling preventive action to avoid wide-scale black outs. In addition, the wide-area capabilities of TAR also include projects for coordination of high-speed communicating transmission protection equipment that would detect events or conditions in the transmission systems and automatically respond to stabilize the system.

IN-PROGRESS PROJECTS

Project 26: Automated Fault Location	
Funding Source: Federal Energy Regulatory Commission (FERC) **Project Timeframe: 4/2012 and ongoing**	Reporting Period Estimated Costs: $<100
Description: The objective of this project is to develop automated fault location for transmission events, using relay events from all line terminals to improve accuracy. This will assist in service restoration and outage duration.	
Update: The team has installed server and software at the data center. Data communication using the company's existing internal secure IP network and hardware is being tested in the lab. Plan is to roll out 10 non-critical substations by end of 2014.	

Project 27: Composite Core Conductor	
Funding Source: FERC **Project Timeframe: 5/2012 and ongoing**	Reporting Period Estimated Costs: $1,661
Description: The objective of this project is to evaluate composite core conductors. The tests will allow for the future use of such conductors system-wide. Due to their material properties, these conductors can be loaded higher than conventional conductors allowing for greater power flow with existing infrastructure. This capability among the conductor's superior sag characteristics will improve operation flexibility. Savings are realized by using composite core conductors that do not require the need to rebuild pole and tower structures.	
Update: During reporting period, approximately 160K feet of conductor was installed for the conductor project.	

Project 28: Dynamic Line Ratings – Transmission	
Funding Source: FERC **Project Timeframe: 7/2011 and ongoing**	Reporting Period Estimated Costs: <$100k
Description: The objective of this project is to pursue the evaluation of available market technologies capable of identifying and calculating dynamic line ratings in real-time and communicate that information to grid operations. The project will determine which product will be most suitable to increase the existing transmission line capacity by realizing the dynamic thermal rating margins available. The selected technology will be used as the basis for establishing dynamic line ratings for the SDG&E transmission system in conjunction with the developed North American Electric Reliability Corporation (NERC) assessments for transmission voltage class levels exceeding 138kV.	
Update: During the Reporting Period, several locations were identified for the selected technology; however, due to uncertainty regarding operational value the project is currently being re-evaluated.	

Project 29: Phasor Measurement Units (PMU) – Transmission	
Funding Source: FERC **Project Timeframe: 2010 and ongoing**	Reporting Period Estimated Costs: $918
Description: The objective of this project is to install high-speed time synchronized PMUs in SDG&E's bulk power transmission network that takes near real-time (sub-second) readings. This information will provide an accurate picture of the grid conditions. The system will also provide the operators, engineers, and planners wide-area situational awareness that will help in understanding system outages and avoid system instability and stress. The synchrophasor data will be shared with Western Electric Coordinating Council (WECC), CAISO, and neighboring utilities, which will provide SDG&E with situational awareness of the entire western area interconnection.	
Update: SDG&E has completed installation of all the PMUs originally planned plus additional 12 PMUs (230 kV and 500 kV) and is transmitting PMU data from selected substations to WECC and CAISO. Testing of Wide-Area Situational Awareness (WASA) and Applications are in progress. SDG&E released an RFQ for WASA software and is in the final stages of onsite testing and evaluation. Plan is to procure the software in the 4th Qtr. 2014. Deployment of the visualization portion at the Grid Control is scheduled start in Q1 2015.	

Project 30: SCADA Expansion – Transmission	
Funding Source: FERC **Project Timeframe: 9/2011 and ongoing**	Reporting Period Estimated Costs: $747
Description: The scope of this project is to install, upgrade, and expand SCADA at substations for the transmission portion of substation SCADA Expansion. This will increase reliability for these substations. The work includes replacing transmission breakers and associated relay panels.	
Update: Several substation projects are underway, in various phases of completion.	

2.3.3.4 ASSET MANAGEMENT, SAFETY AND OPERATIONAL EFFICIENCY

Asset Management, Safety and Operational Efficiency (AMSOE) enhances monitoring, operating, and optimization capabilities to achieve more efficient grid operations and improved asset management. AMSOE includes projects that would allow SDG&E to manage the maintenance and replacements of energy infrastructure based on the health of the equipment versus a time base approach. This functionality would help to avoid critical energy infrastructure failures as well as manage costs associated with maintaining and replacing equipment.

IN-PROGRESS PROJECTS

Project 31: Advanced Ground Fault Detection	
Funding Source: GRC **Project Timeframe: 6/2011 and ongoing**	Reporting Period Estimated Costs: <$100K
Description: The objective of this project is to provide enhanced ground fault detection schemes for distribution circuits to improve detection of operational issues. The project will also install protective relay systems to detect high impedance faults, where the fault current may be very low and the resulting arcing fault may provide erratic current input to the protective relay. The effort is concentrated on the protective relays for distribution feeder and on pole-mounted service restorers. The advanced protection system will provide faster isolation of downed conductors, promoting enhanced safety and improved service reliability.	
Update: The project is in the deployment phase with 135 reclosers targeted for software upgrade and 71 for controller replacement in 2014 During this period, SCADA system monitoring of previously installed equipment sites was used to refine the advanced ground fault detection logic for improved performance.	

Project 32: Arc Detection – Distribution	
Funding Source: GRC **Project Timeframe: 7/2012 - 12/2014**	Reporting Period Estimated Costs: $316
Description: The objective of this project is to develop the capabilities for arc detection on 12 kV overhead circuits. The monitoring equipment will perform data collection and analysis of arcing along long spans. The project will utilize a radio frequency signal to provide fault locations. The evaluation and deployment of this technology will assist in fire prevention activities in fire-prone areas.	
Update: During the reporting period, the team has received the final product and has begun testing and validation.	

Project 33: Arc Detection – Transmission	
Funding Source: FERC **Project Timeframe: 4/2012 and ongoing**	Reporting Period Estimated Costs: $389
Description: The objective of this project is to develop the capabilities for arc detection on 230 kV overhead conductors on transmission lines. The project will install arc detection sensors and substation grade communication gateways to monitor the transmission lines. The monitoring equipment will perform data collection and analysis of arcing along long spans. The project will leverage wireless communication signals to provide fault locations.	
Update: Sensor and gateway development, testing, and evaluation are still underway.	

Project 34: Condition-Based Maintenance (CBM) –Substation Transformers • **Substation Advanced Analytics (SAA)**	
Funding Source: GRC and FERC **Project Timeframe: 2007 to 2015**	Reporting Period Estimated Costs: $4,639

Description: The objective of this project is to extend the useful life and make greater utilization of distribution substation transformers and transition these to condition-based maintenance. The project will utilize technology to monitor the performance/condition of system assets and will provide actionable alerts when attention is required. Substation Advanced Analytics technology includes:

- Provide advanced analytical features for substation assets to use in business planning, operations, and engineering
- Use equipment-specific thresholds to improve tolerances around alarms
- Provide additional real-time analysis and decision making tools to operators, for use during critical peak times
- Develop improved dissolved gas analysis (DGA) software for both the main tank of a transformer, and a transformer's load tap changer (LTC)
- Automate the calculations required to determine the real-time loading capability of a transformer (What If/Load Spike Software)
- Automate the calculations required to determine a transformer's true remaining life utilizing existing CBM data (Loss of Life Software)
- Develop software to automate reliability assessments of a substation to more efficiently spend capital replacement dollars
- Extend the useful life and utilize extra load capacity in transformers (capital deferment)
- Failure prevention via DGA monitoring for transformer main tank and LTC

Update: During the Reporting Period, the team deployed CBM monitors at 16 substations with 43 transformers, bringing the project installations to 104 substations and 287 transformers to-date. The Substation Advanced Analytics portion of the project is in the planning stages and engaged in vendor negotiations.

Project 35: Distribution Interconnection Information System (DIIS)	
Funding Source: GRC **Project Timeframe: 7/2012 – 12/2013**	Reporting Period Estimated Costs: $721
Description: The DIIS Phase 2 project will build functionalities to track EVs and new functionality to add Rule 21 (advanced energy storage, fuel cells, and biogas), Wholesale Distribution Access Tariff (WDAT) applications to the existing NEM functionalities built in Phase 1. DIIS will provide analytical tools and reporting functionality for customer-owned generation as well as electric vehicle assets on SDG&E's electric network in combination with other electric customer data.	
Update: The DIIS for NEM application successfully deployed on February 18, 2013 for solar contractors, customers, and internal users. The project enabled the Remote Meter Configuration (RMC) functionality for NEM customers so that the meter program could be changed remotely the majority of the time. The RMC functionality avoids the cost of a crew rolling trucks to physically change out or reprogram customer meters. Currently the DIIS application has over 1,000 solar contractors and homeowner users registered. Over 20,500 NEM solar applications have been submitted online through the DIIS system since June 2013. In addition, contractors and customers receive consistent communications and can check their application status online.	

Project 36: PEV Infrastructure Upgrades • EV Transformer Impact Study	
Funding Source: GRC **Project Timeframe: ongoing**	Reporting Period Estimated Costs: <$100
Description: The objective of this project is to expand utility infrastructure in a manner that enables the safe, reliable, and efficient integration of PEV charging loads with the utility grid, including separate, and large charging station networks. The project will also upgrade the electric distribution system to accommodate increased numbers of PEVs. Upgrades include facilitating customer panel upgrades, residential distribution transformers, services, and potential circuit upgrades.	

Project 36: PEV Infrastructure Upgrades • EV Transformer Impact Study	
Update: SDG&E completed five residential service upgrades related to PEVs from July 2013 through June 2014. Two of the five upgrades also required a distribution system upgrade to a larger transformer.	

Project 37: Smart Isolation and Reclosing	
Funding Source: GRC **Project Timeframe: 4/2012 - 10/2014**	Reporting Period Estimated Costs: $1,114
Description: The objective of this project is to apply off-the-shelf pulse closing technology at additional points on the system. SDG&E has already applied this technology, which limits the amount of energy that the utility re-closes back into faulted circuits, improving public safety.	
Update: The project is 95% complete and should conclude within the next few months.	

Project 38: Smart Transformers	
Funding Source: GRC **Project Timeframe: 10/2011 and ongoing**	Reporting Period Estimated Costs: $168
Description: The objective of this project is to install monitoring devices on all transformers serving customers with charging stations for PEVs that are purchased between 2010 and 2020. Sensing devices attached to the transformers will be used to monitor real-time loading and establish accurate load profiles. The project will also include analysis and evaluation of transformer bushing mounted devices presently on the market.	
Update: SDG&E is working with the manufacturer to enhance the load monitor accuracy on both the pole top and pad mounted units. Additionally SDG&E continues to test the load monitors in the Integrated Test Facility.	

Project 39: Advanced Distribution Management System (ADMS)	
Funding Source: GRC **Project Timeframe: 9/2013 to 12/2015**	Reporting Period Estimated Costs: $2,883

Description: The scope of this project is to implement new functions within the new OMS/DMS system to support current and future Smart Grid initiatives for managing the electric distribution grid. The project will be delivered in two phases:

Phase 1 – OMS enhancements (ping, outage filter, service alerts, outage website, mobile improvements), implement DMS features of NMS v1.10 (power flow analysis, Fault Location Analysis (FLA), Feeder Load Management (FLM), Suggesting Switching (SS), Fault Location Isolation Service Restoration (FLISR) and Volt/VAR).

Phase 2 – Integrate DER into the DMS. This phase requires a new version of NMS v1.12 to take advantage of the capabilities of these assets and maintain DMS functionality. This project is an essential component of the implementation of the Smart Grid roadmap.

Update: During the Reporting Period, the following key activities were performed:

- Implemented Fault Location Isolation Service Restoration (self-healing grid) functionality
- Developed DMS requirements to improve the DMS Powerflow calculation reflecting both DER generation and customer load and the accuracy and planning horizons for Suggesting Switching, Fault Location Analysis, Feeder Load Management, and Fault Location Isolation Service Restoration
- Developed OMS requirements improving content described in internal outage communications
- Conducting functional and technical testing

Project 40: Solar Power Prediction	
Funding Source: GRC **Project Timeframe: 11/2012 – 12/2015**	Reporting Period Estimated Costs: $994
Description: SDG&E requires solar power generation predictions for real-time operations and day-ahead generation commitments, marine layer predictions, net load predictions, and other core predictive information for multiple stakeholders. SDG&E is developing and implementing a PV power prediction engine and marine layer location prediction engine.	
Update**:** The project is actively monitoring and testing 12 sample sites and the marine layer location prediction engine is in production.	

Project 41: Managing EV Charging • **Optimization of Pricing & Resource Allocation (OPRA)**	
Funding Source: GRC **Project Timeframe: Ongoing**	Reporting Period Estimated Costs: $233
Description: This project was formerly named the "Flexible Demand Initiative." SDG&E will leverage its work with stored energy controls and dispatch to demonstrate and evaluate wholesale market participation of flexible loads such as energy storage systems and EV charging.	
Update: By late 2014 SDG&E will, in coordination with its technology partners, aggregate and bid energy storage resources and vehicle charging load into the CAISO wholesale markets utilizing the CAISO's Proxy Demand Resource (PDR) framework. In doing so, the project will demonstrate participation in the wholesale energy market for aggregated DER and identify barriers to future, large-scale wholesale market participation and the provision of additional ISO services. **OPRA:** Phase one implementation is complete and the utility is ready to demonstrate participation in the CAISO wholesale PDR Energy Market beginning in Q3 2014.	

Project 42: Condition-Based Maintenance (CBM) – Gas Breakers	
Funding Source: FERC **Project Timeframe: 09/2013 – ongoing**	Reporting Period Estimated Costs: $255
Description: This project is to extend the useful life and make greater utilization of the transmission SF6 gas insulated substation circuit breakers. The project will utilize technology to monitor the performance and condition of system assets to identify issues prior to causing a serious unplanned outage and prior to losing the expensive asset prematurely. The project scope is to comply with one percent (1%) SF6 Emissions Regulations in 2020 and reduce major overhaul periodicity related to contact interrupter wear. The deployment of gas circuit breaker SF6 monitoring equipment will enhance the tracking and "manual" Condition Based Maintenance program. This technology will also monitor the gas within the circuit breaker allowing for early detection of any leaks to ensure compliance with applicable environmental regulations.	
Update: During the reporting period, the team entered into contract with the hardware monitor vendor and initial orders have been placed. Equipment is expected to begin arriving by the end of September. Engineering contracts are under development with an expected execution date by the end of August. Engineering design is slated to begin in September with construction beginning in October. The construction window is planned for October 2014 through December 2019.	

Project 43: Smart Grid Enabled Energy Efficiency	
Funding Source: Application Energy Efficiency (A.12-07-002) **Project Timeframe: 1/2013 to Ongoing**	Reporting Period Estimated Costs: $4,219
Description: SDG&E's Smart Grid Enabled Energy Efficiency project consists of the Energy Advisor program included in SDG&E's Energy Efficiency application (A.12-07-002) filed on July 2, 2012. The Energy Advisor program is designed to bring together all services offered to support customer education and participation in energy efficiency, demand response and self-generation, energy reducing opportunities and benefits, along with awareness of greenhouse gas and water conservation activities within one program. These services include benchmarking, an online energy audit tool, non-residential audits, pump efficiency services retro-commissioning and coordination with audits.	
Update: During the Reporting Period, the project team launched the Business Energy Assessment (BEA) Online Tool and the ASHRAE Level II Comprehensive Audit Program (EC, EE, DR, DG). The launch of these programs, in combination with SDG&E's longstanding programs such as the benchmarking service, retro-commissioning program, and pump efficiency program, translates into the Energy Advisor program for SDG&E clients. In addition, the team created the Continuous Energy Improvement (CEI) Program as an enhancement to the Energy Advisor Program. The CEI Program engages small and medium customers for a six-month education process to bring awareness on long-term energy savings solutions.	

Project 44: Second Use of EV/PEV Batteries in Stationary Applications	
Funding Source: DOE **Project Timeframe: 4/2011 and ongoing**	Reporting Period Estimated Costs: <$100
Description: This is a DOE- National Renewable Energy Laboratory (NREL) awarded project focused on developing and testing applications and application-specific load profiles for end-of-life traction PEV batteries. The demonstration site hosts a four-channel, bi-directional power supply capable of consolidating the operation of existing on-site PV generation with second use energy storage systems from vehicles. It serves local load, smooths intermittent renewable generation, provides ancillary services (voltage and frequency regulation), tests dispatch	

Project 44: Second Use of EV/PEV Batteries in Stationary Applications	
algorithms and associated duty cycles, and investigates system capability for use in customer applications such as vehicle charging and energy arbitrage.	
Update: The project team developed integration with Power Analytics Paladin data software system to achieve real-time dispatch of energy storage system (ESS) based on UCSD Campus Microgrid situational awareness. Inputs from the Campus' solar irradiance forecast and historical building loads are used to algorithmically command real-time dispatch profiles to achieve Ancillary Service, Photovoltaic Smoothing and Demand Charge Management objectives. Sub-cycle dispatch algorithms have been implemented to enable the ESS respond to perform voltage and frequency response support (voltage and frequency regulation; up and down). Additionally, and in parallel, the system has been configured to sustain energy harvested from mid-day peak generation for dispatch in the later hours of the day when generation drops off. Each of these applications are running daily, with data collection ongoing. Additionally, CEC PIER funded work in this space to advance standardization of ESS modules to enable optimization of system design for first and second use. This work will mature in 2014 with presentation of results occurring at conferences and in public forums.	

2.3.3.5 SECURITY

Physical and cyber security protection of the electric grid is essential and becomes more so as the Smart Grid is deployed. The communications and control systems that are required to enable Smart Grid capabilities have the potential to increase the reliability risks of Smart Grid deployments if they are not properly secured. The security program includes a comprehensive set of capabilities to address the increased physical and cyber security requirements associated with the development, implementation, operation, and management of Smart Grid systems and edge devices. These projects would place and execute security throughout the network to resist attack, manage compliance and risk, and support security from the physical to application layers.

IN PROGRESS PROJECTS

Project 45: Cybersecurity Projects	
Funding Source: GRC **Project Timeframe: Ongoing**	Reporting Period Estimated Costs: $2,517

Description: SDG&E is deploying several cybersecurity projects in conjunction with Smart Grid deployment. SDG&E's risk-based enterprise security program also includes multiple projects that further enhance the security posture of the company, its operations, and the grid.

SDG&E's projects related to cybersecurity include efforts in the categories of risk and vulnerability management, compliance, operations, research, and improving the protection of customer privacy.

Costs for the physical and cyber security of Smart Grid systems are not isolated within these projects. All other Smart Grid investments include additional security-related costs, particularly those that are specific to the project scope or technology.

As this *Annual Report* is a public document, details of SDG&E's security projects are omitted.

Project 46: Customer Privacy Program	
Funding Source: GRC **Project Timeframe: Ongoing**	Reporting Period Estimated Costs: $1,200

Description: In March 2011, as the CPUC's decision to implement new privacy rules for the electric investor-owned utilities was being revised, SDG&E formally established its customer privacy program to align with its Privacy by Design vision. It also established a cross-functional privacy committee reporting to a lead director on privacy and ultimately the Chief Customer Privacy Officer of the company. Since being established, the program has worked to develop a privacy controls framework for the utility and to educate employees about the new rules established by company policy and the CPUC.

Update: SDG&E's Office of Customer Privacy has completed the initial phases of its privacy project and operationalized its privacy program. As reported last year, the program uses a foundational set of privacy controls based on the Generally Accepted Privacy Principles to manage privacy risk. The program uses a Privacy Impact Assessment (PIA) to determine privacy risk levels and applicable privacy controls. Privacy GreenLight is now the standard for specific types of customer data sharing requests.

There are two major events shaping SDG&E's privacy program today. First, in May 2014, the CPUC voted out the Smart Grid III Energy Data Access decision (D. 14-05-016) which ordered the utilities to a) share customer usage data aggregated by zip code and customer type on a public website, and b) develop a data request and release process for specific third parties, such as researchers and government agencies. Second, as of June 2014, SDG&E was undergoing an independent third party audit of its privacy and security practices for inclusion in its General Rate Case, as mandated by Smart Grid I Decision Adopting Rules to Protect the Privacy and Security of Electricity Usage Data (D. 11-07-056). The outcome of this audit report may influence some of the near-term priorities of the privacy program.

Project 47: Substation Physical Security Hardening	
Funding Source: FERC **Project Timeframe: 2011 and ongoing**	Reporting Period Estimated Costs: $4,285
Description: The objective of this project is to complete NERC/CIP compliant corporate security system upgrades to electrical substations. Technology upgrades, revisions to business processes, and personnel training are included in scope. As this *Annual Report* is a public document, details of SDG&E's security projects are omitted.	

2.3.3.6 INTEGRATED AND CROSS-CUTTING SYSTEMS

Integrated and cross-cutting systems refer to projects that support multiple Smart Grid domains, such as grid communications, application platforms, data management and analytics, advanced technology testing, and workforce development/technology training. An integrated approach for these projects will ensure that investments are managed efficiently while creating the platform to deliver a stream of benefits across SDG&E's operations and to its customers.

Integrated communications systems will provide solutions to connect and enable sensors, metering, maintenance, and grid asset control networks. In the mid-to-long term, integrated and cross-cutting systems will enable information exchange with SDG&E, service partners and customers using secure networks. Data management and analytics projects will improve the SDG&E's ability to utilize vast new streams of data from transmission and distribution automation and Smart Meters for improved operations, planning, asset management, and enhanced services for customers.

Advanced technology testing and standards verification are foundational capabilities for SDG&E to evaluate new devices from vendors and test them in a demonstration environment prior to deployment onto the electric system. This reduces the risks associated with new technology projects, and helps SDG&E maximize technology performance and interoperability prior to deployment.

Workforce development and advanced technology training enables the successful deployment of new technologies, ensuring that SDG&E's workforce is prepared to make use of new technologies and tools in order to maximize the value of these technology investments.

IN PROGRESS PROJECTS

Project 48: Integrated Test Facility	
Funding Source: GRC **Project Timeframe: 9/2012 and ongoing operations**	Reporting Period Estimated Costs: $1,435
Description: The SDG&E Integrated Test Facility (ITF) will be used to support electric system and information technology integration for smart concept evaluation and testing – both devices and software. Integration spans both utility- and customer-owned equipment and systems. Key aspects of this project include simulation, experimentation, analysis, visualization, integration, demonstration, testing, and validation.	

Project 48: Integrated Test Facility	
Update: The construction of the facility was completed at the end of 2013, and partially equipped in early 2014. Testing is taking place in six of the seven labs in support of GRC capital and RD&D projects. In addition, the facility is being equipped to host Energy Program Investment Charge (EPIC) projects when they begin in early 2015. The seven labs are available to increase the scope of testing immediately in the following areas: system modeling with high renewable penetration on the grid, smart inverters integration, demand-side energy management and communications integration, and information security protections. The ITF is also available to be configured for testing additional concepts and technologies like distributed control, electric vehicle integration, and other nascent technologies.	

Project 49: SDG&E Grid Communications Systems (SGCS) • **Low Power Wide Area Communications Network** • **Substation Communications** • **Field Broadband Device Connections** • **SCADA Optimization and Enhancements**	
Funding Source: GRC and DOE **Project Timeframe: 2010 to 2014**	Reporting Period Estimated Costs: $16,550
Description: SDG&E Grid Communication Services will implement an advanced wireless communications system that will allow SDG&E to monitor, communicate with, and control transmission and distribution equipment, thus accelerating deployment of Smart Grid applications and devices.	
Update: Eight WiMAX over private 2.3 GHz pilot Field Area Network (FAN) sites and related microwave backhaul services were constructed during this period. However, after reviewing results from these pilots, SDG&E concluded that its field communication requirements were better served by multiple application-specific networks. Most of the proposed Smart Grid devices have low data rate requirements that can be easily satisfied by enhanced SCADA and other low bandwidth networks. The team submitted the change of scope to DOE for approval in July 2013, and it was approved on Aug. 2, 2013. • Low-Power Communications Network (LPCN) – Unlicensed 2.4 GHz proprietary advanced	

Project 49: SDG&E Grid Communications Systems (SGCS) • **Low Power Wide Area Communications Network** • **Substation Communications** • **Field Broadband Device Connections** • **SCADA Optimization and Enhancements**	
wireless capability providing low speed, low-power, wide-area communications for remote monitoring of overhead/underground fault circuit indicators (FCI), smart transformers, aviation warning lights, and other low bandwidth assets. Through June 2014, 29 of 110 sites have been completed. • Substation Communications – Expand SDG&E's Wide-Area Network (WAN) to connect additional substations via microwave and last-mile fiber. Also, new substation Local Area Networks (LANs) will provide transport for endpoint sensor data. Through June 2014, project engineering, design, and majority of pre-construction foundation work has been completed. • Field Broadband Device Connections – Broadband connections at targeted locations to support PMUs and other applicable, high-speed, Smart Grid devices that are installed on distribution circuits. Through June 2014, project engineering, design, and initial construction work was completed. • SCADA Optimization and Enhancements – Implement an upgraded narrowband SCADA system to increase SCADA system capacity and increase reliability and control of the electrical grid, including the ability to quickly restore power in the event of major black outs, and auto-de-energize damaged distribution circuits to minimize risk of wild fire, life, and property. Through June 2014, Near Term Relief deliverables were completed and put into production. Design and engineering was completed for SCADA IP Radio work scope.	

Project 50: Electric Program Investment Charge (EPIC) Program	
Funding Source: EPIC **Project Timeframe: Ongoing**	Reporting Period Estimated Costs: $211
Description: SDG&E's First Triennial EPIC Plan was approved by CPUC and consists of five pre-commercial demonstration projects on smart-grid related issues, which are targeted at creating	

Project 50: Electric Program Investment Charge (EPIC) Program	
knowledge to inform and improve the smart grid deployment projects: 1. Grid Support Functions of Distributed Energy Resources 2. Smart Distribution Circuits 3. Distributed Control for Smart Grids 4. Smart Grid Architecture 5. Visualization and Situational Awareness	
Update: These EPIC projects are not deployment programs in themselves. CPUC also encouraged SDG&E to use EPIC funds for a PEV-related submetering project that was ordered in a separate OIR. To do so, in early 2014 SDG&E filed a Petition for Modification to its approved EPIC projects, because the submetering project would require about half of the funds allotted to SDG&E for the First Triennial EPIC Cycle. SDG&E has not yet received a ruling on this Petition. While waiting for the ruling, SDG&E has started work on half of the approved EPIC projects above—Projects 1, 2 and a reduced scope version of 3. The RFPs to select contractors for these projects are being written at the time of this smart grid report filing. SDG&E is also partially implementing its EPIC plan for pre-commercial demonstrations (a concept introduced and defined in the EPIC decision). About half the plan is being implemented at this time, with the remainder still subject to a decision on a Petition for Modification filed by SDG&E in early 2014.	

Project 51: Unmanned Aircraft System (UAS)	
Funding Source: GRC **Project Timeframe: 2013 and ongoing**	Reporting Period Estimated Costs: <$100K
Description: The objective of the program is to research and evaluate SDG&E UAS use cases. Enhance the unmanned aircraft system to meet SDG&E requirements (e.g. camera technologies, proximity sensors, on-board data storage, enhanced data streaming). Investigate	

Project 51: Unmanned Aircraft System (UAS)	
and research capabilities of flight pattern software (preprogramed flight pattern).	
Update: Purchased two prototype UAS. On June 26, SDG&E was granted a Special Airworthiness Certificate by the Federal Aviation Administration (FAA) for experimental use of an Unmanned Aircraft System (UAS). SDG&E was the first utility to be granted experimental airspace for UAS and first civilian company to be granted experimental airspace for quad-rotor type UAS in the nation. Currently, in the process of submitting Section 333 which allows SDG&E to fly for commercial use.	

Project 52: Smart Grid 2.0 Engineering and Architecture	
Funding Source: GRC **Project Timeframe: 2013 and ongoing**	Reporting Period Estimated Costs: $0
Description: The objective of this project is to ensure technical, secure, reliable, efficient, and integrated operation among Smart Grid projects and programs by establishing systems engineering and architectural descriptions for the SDG&E Smart Grid as a holistic system of systems, meeting the company's overall need for cost-effective deployment.	
Update: During the Reporting Period, the project rejected the use of a third party software system to manage SGEA information. SGEA capability and interaction data collection complete (70 of 114 Smart Grid-related systems/technologies), database and application programming in initial phases, scheduled for completion 4Q2014 – 1Q2015. As a result, the project team has focused on data collection to blueprint the utility's existing Smart Grid-related systems. A basic data collection form was created and a series of interviews are in progress to capture: • System ownership • Support for Smart Grid functions • System capabilities • Business processes supported • System interfaces	

ENTERPRISE PROJECTS

Project 53: Workforce Development • **California Smart Grid Center Collaboration** • **Customer Contact Center (CCC) Transformation**	
Funding Source: GRC **Project Timeframe: Ongoing**	

Description:

California Smart Grid Center Collaboration: This project will result in the implementation of recruiting strategies and client partnerships necessary to manage the Smart Grid related workforce.

CCC Transformation: This project will put in place the training, communication, policies, and practices necessary to ensure that as the many Smart Grid-related initiatives are implemented so that change management is handled consistently and effectively. This initiative develops new job skills for some employees, new positions for other required job skills, and new business processes to ensure continued compliance with regulatory and safety mandates.

Update:

California Smart Grid Center Collaboration: The Smart Grid Center is continuing work on the four courses focused on Smart Grid curriculum that it will ultimately offer online. The Center is in the process of identifying additional grant funding to complete this work. SDG&E invited the Smart Grid team to San Diego and conducted a meeting with subject matter experts in this arena, including directors, managers, and engineers. The purpose of the meeting was to give feedback on the curriculum. A survey was developed to provide tangible information for the professors to use in this effort. During this reporting period, the courses have been completed and are all online at this time and available for students to enroll. Next steps include providing an overview to company employees that might have interest in utilizing education reimbursement benefit and taking these courses.

CCC Transformation: Customer Contact Center employees have undergone training to allow a broader range of services to be offered during phone and other interactions with customers to become more of a trusted energy advisor rather than a transaction-oriented order taker. Employees have gone from being ‘Customer Service Representatives’ to ‘Energy Services Specialists,’ and initial training started with net-energy metering and electric vehicles.

Project 54: Data Management and Analytics • **Enterprise Analytics System (EAS)** • **Customer Analytics System (CAS)** • **Operational Analytics Systems (OAS)** • **Smart Grid Analytics (SGA)**	
Funding Source: GRC **Project Timeframe: 2013 and ongoing**	

Description: The Data Management and Analytics project will provide infrastructure to store and analyze the vast amounts of data generated by existing applications as well as Smart Grid systems. New analytics tools will be deployed and specifically tailored to the Smart Grid business domains to uncover a greater understanding of this new data in areas such as demand forecasting, situational analysis, optimization, and customer usage analytics. Underlying foundational capabilities include ensuring that internal company data is consistently used and aligned with external Smart Grid industry standards.

EAS is a project combining Customer (CAS) and Operational Analytics Systems (OAS) to create a single point of analysis and data for the whole company. CAS is a project to enhance SDG&E's enterprise capabilities to leverage customer data assets into useful, actionable insights for executives, managers, power users, and customer-facing personnel. It will allow for real- time analytics for grid operators and general analytics for all employees. EAS combines a number of efforts to incorporate the enterprise strategy. There are several efforts currently underway to realize the strategy. The first is predictive and prescriptive analytics that will be woven into operational processes at the contact center, to tailor offers to customers who have the highest propensity to accept the offer. The second effort is to provide analytics for situational awareness of the utility's Smart Meter network, again analytics being inserted into operational business processes. The third effort is forecasting and planning, providing more granular analytics about solar generation and how it impacts the grid at the transformer and circuit level. Each of these efforts require some foundational components such as an enterprise data model and a centralized data lake.

Smart Grid Analytics (SGA) will implement new data sources for the load forecasting process and for planning power flow analysis:

Net-metered PV Contribution: Determine the contribution from net-metered PV generation for each circuit, using installed system nameplate capacities and output from nearby metered PV

Project 53: Workforce Development • **California Smart Grid Center Collaboration** • **Customer Contact Center (CCC) Transformation**	
systems. Planning Power Flow Analysis: Feed Smart Meter data into SynerGEE, enabling the models to factor in actual loads on a circuit rather than using connected kVA distribution loads on a circuit. Upgrade SynerGEE client software to V5, improving PV modeling and other functions. Deploy client workstations updated technology to speed up modeling.	

Project 55: The California Systems for the 21st Century Collaboration (CES-21)	
Funding Source: SB96 and CPUC Authorization Decision **Project Timeframe: 2012 and ongoing**	
Description: CES-21 involves the CPUC and California IOUs collaborating with Lawrence Livermore National Laboratory (LLNL) to improve and expand energy systems to meet 21st century needs. CES-21 plans to create a set of collaborative technology development initiatives that will accelerate the deployment of advanced systems and technologies from renewable generation to Smart Grid technology. CES-21 current plan is to develop project proposals in four areas: electric resource planning, Smart Grid operational tools, cybersecurity and gas system planning, and operational tools.	
Update: Senate Bill 96, was signed by the Governor in October 2013, modifying the original December 2012 CPUC Decision. The proposed joint IOU CES-21 projects, Cybersecurity and Grid Integration with a $35 million budget, were authorized in D.14-03-029. Joint Advice Letters 4402-E (Pacific Gas & Electric Company), 4040-E (Southern California Edison Company), and 2592-E (San Diego Gas & Electric Company) were filed on April 25, 2014. The IOUs and Lawrence Livermore National Laboratory revised the Cooperative Research and Development Agreement (CRADA) for the Advice Letter.	

2.4 IMPACTS TO THE SMART CUSTOMER, SMART MARKET, AND SMART UTILITY

Table 5 discusses the impacts from each of SDG&E's Smart Grid project categories to the Smart Customer, Smart Market, and Smart Utility areas.

Table 5: Impacts to Smart Customer, Market, and Utility by Project Category

Project Category	Smart Customer	Smart Market	Smart Utility
1. **Customer Empowerment and Engagement**	Smart Meters, Green Button, and related web-based and mobile apps empower SDG&E's customers by giving them a means to conveniently access their usage data and giving them greater control over how and when they use energy. Because these are standards-based, open access initiatives, they also enable new applications and information services that provide greater value to customers.	Projects such as Green Button Connect My Data and Smart Pricing Program contribute to the development of a Smart Market by providing a platform for third parties to develop new products and services, encouraging changes in customer behavior through new pricing and rate models. Connected to the Sun opens access to solar generation to all customers, even those lacking capital or property to install their own.	Smart Meters, Demand Response programs, and DER- and PEV-related projects are helping to create a Smart Utility by supporting the reliable and cost-effective integration of widespread intermittent renewable generators and PEVs, as well as new TOU rates that send more accurate price signals to customers.
2. **Distribution Automation and Reliability**	These projects contribute to the Smart Customer through Sustainable Community Programs and the Borrego Springs Microgrid	Projects in this category help drive a Smart Market through development and deployment of technologies that will enable high penetrations of renewable distributed	Projects such as Advanced Energy Storage, SCADA Expansion, and SCADA Capacitors enable the Smart Utility by empowering distribution system operators with

Project Category	Smart Customer	Smart Market	Smart Utility
	Demonstration that advance community awareness of Smart Grid technologies and benefits so that customers understand the role of these investments in improving distribution system reliability and power quality.	generation and PEVs, and utility-integrated microgrids that will provide new options for differentiated reliability services in the future.	energy storage options that expand capacity as well as improved reliability through better failure detection and prediction, improved power control, and faster isolation of faulted electric distribution circuits for faster load restoration.
3. **Transmission Automation and Reliability**	Projects in this category contribute to the goals for the Smart Customer by integrating large-scale centralized renewables while maintaining reliable services to customers and helping to avoid large-scale outages that economically impact customers.	Projects such as PMUs and SCADA Expansion will help build a Smart Market by using sensing and control technologies to improve wide-area situational awareness, leading to more efficient market operations and maintaining reliability while integrating large-scale intermittent renewable generation sources.	Projects such as PMUs contribute towards the objectives of the Smart Utility by using innovative approaches to maximize network capacity, while others include advanced materials, sensors, and control systems that will help maintain or improve reliability.
4. **Asset Management, Safety, and Operational Efficiency**	These projects help to create the Smart Customer by making improvements and advances to systems that will optimize investments, system	Projects in this category such as the OPRA contribute to the Smart Market by integrating technologies and services that benefit the grid while creating opportunities for	The Smart Utility will be realized in part through projects such as CBM, and Smart Isolation and Reclosing, which proactively manage asset health, improve situational

Project Category	Smart Customer	Smart Market	Smart Utility
	efficiency, and public safety. Projects such as the advanced technology integration and outreach efforts that will reach large numbers of customers.	innovative new business models.	awareness, maximize operational and system efficiency, while protecting worker and public safety.
5. **Security**	SDG&E's Office of Customer Privacy will help develop the Smart Customer by ensuring that the ever-increasing amount of data collected for and about customers is appropriately managed and protected by SDG&E while being responsibly made available to authorized third parties after customer authorization or due to legal or regulatory mandates.	A Smart Market must guarantee the availability of systems, confidentiality of information, and integrity of data and transactions, all of which depend on a robust risk-based security program.	Projects in this category help to create the Smart Utility by ensuring that systems, assets, and customers are protected from physical and cyber security issues that could affect reliability or customers' trust in the system.

Project Category	Smart Customer	Smart Market	Smart Utility
6. **Integrated and Cross-cutting Systems**	Projects in this category ensure Smart Customers are be served by a Smart Utility workforce that understands their preferences and needs for more tailored energy services.	Enabled in part by EPIC and integrated system testing efforts in this project area, the Smart Market will develop with assurance that interoperable systems will support market and transaction integrity.	Projects in this area will ensure robust and secure communications are widely available and enable cost-effective implementation of sensor and control capabilities that provide a variety of benefits. Workforce development initiatives will ensure that skills of existing employees evolve, and future hires have the blend of skills needed for the Smart Utility.

2.5 CUSTOMER ROADMAP

2.5.1 INTRODUCTION / BACKGROUND

SDG&E's Customer Roadmap describes the customer outreach and engagement plans needed to support those Smart Grid projects that directly impact customers. A summary of SDG&E's assessment of customer impacts and detailed engagement plan summaries and timeline are included.

2.5.2 CUSTOMER OUTREACH AND ENGAGEMENT PLANS

This *Annual Report* updates 55 SDG&E Smart Grid projects, grouped by the following project areas: Customer Empowerment, Distribution Automation and Reliability, Transmission Automation and Reliability, Asset Management, Security, and Integrated Cross-Cutting Technologies. SDG&E has assessed the customer outreach and engagement efforts needed for each of these projects based on the level of customer impact according to three categories: Direct Customer Outreach, Evident to Customers, and Less Evident to Customers, as shown in Table 6.

The first category, Direct Customer Outreach, refers to projects that require direct communications with or tools and programs for customers; therefore, requiring direct customer outreach and engagement plans. These projects intend to provide customers:

- Pricing plan options that better meet their needs, including time-variant and green rates, and the information and tools they need to make informed choices
- HAN capabilities in Smart Meters
- Incentives and the capability to vary their load in response to price or other signals (demand response)
- Information for those considering a PEV purchase
- Energy usage information for themselves or their designated third parties
- Customer Privacy controls that align with company policy, State and Federal mandates and with Privacy by Design principles.

These projects will require that SDG&E work with customers and service providers to increase customer engagement with and adoption of new energy management technologies and behaviors. The second group, Evident to Customers, contains projects that are not squarely focused at the customer, but rather on the grid side of the meter but still physically evident to customers. These projects generally address reliability and/or power quality concerns, and due to their size or operational characteristics, may also garner concern from customers. For example, a community storage (Advanced Energy Storage – Distribution) system might consist of a large piece of equipment –

perhaps just smaller than a compact automobile – placed in the utility right-of-way that many customers are likely to notice.

The third project group, Less Evident to Customers, contains projects that, like group two, are not squarely focused at the customer but rather on the grid side of the meter, and in this case, will largely be transparent to the customer. These projects generally address reliability and/or power quality issues, provide efficiencies or technical improvements, and may include the installation of equipment that is not imposing or that may be located in the substation and that, in general, customers simply will not see. That said, these projects are still a vital part of the Smart Grid, and customers will need to have a high-level idea about the issues they are designed to address and have confidence that investments in these projects are wise for system reliability and power quality purposes.

Table 6: Customer Outreach and Engagement Assessment

Smart Grid Program Area	Direct Customer Outreach	Evident to Customers	Less Evident to Customers
Customer Empowerment			
1 – Smart Meters	X		
2 – PEV Rate Experiment			X
3 – Centralized Calculation Engine			X
4 – Connected…to the Sun	X		
5 – Green Button Connect My Data	X		
6 – Smart Grid Demand Response Programs	X		
7 – Electric Vehicle (Clean Transportation) Education and Outreach	X		
8 – Demand Response Management System (DRMS)	X		
9 – Smart Pricing Program (Dynamic Pricing)	X		
10 – Smart Meter Operations Center			X
11 – Critical Peak Pricing Default (CPP-D) for Medium Commercial Customer	X		
12 – Digital Roadmap	X		
13 – Community and Stakeholder Engagement	X		
Distribution Automation and Reliability			
14 – Dynamic Voltage Control			X
15 – Solar Energy Project		X	
16 – Advanced Energy Storage		X	

Smart Grid Program Area	Direct Customer Outreach	Evident to Customers	Less Evident to Customers
17 – Dynamic Line Rating (Dist)			X
18 – Borrego Springs Microgrid	X		
19 – Phasor Measurement Unit (PMU) (Dist.)			X
20 – Sustainable Community Programs	X		
21 – SCADA Capacitors		X	
Distribution Automation and Reliability			
22 – SCADA Expansion (Dist)			X
23 – Wireless Fault Indicators			X
24 – EV Demand Response	X		
25 – Distributed Energy Resource Management Solution (DERMS)			X
Transmission Automation and Reliability			
26 – Automated Fault Location (Trans)			X
27 – Composite Core Conductor (Trans)			X
28 – Dynamic Line Rating (Trans)			X
29 – Phasor Measurement Unit (PMU) (Trans)			X
30 – SCADA Expansion (Trans)			X
Asset Management, Safety and Automation			
31 – Advanced Ground Fault Detection			X
32 – Arc Detection (Dist)			X
33 – Arc Detection (Trans)			X
34 – Condition-Based Maintenance - Substation Transformers			X
35 – Distribution Interconnection Information System (DIIS)			X
36 – Plug-In Electric Vehicle (PEV) Infrastructure Upgrades			X
37 – Smart Isolation and Reclosing			X
38 – Smart Transformers		X	

Smart Grid Program Area	Direct Customer Outreach	Evident to Customers	Less Evident to Customers
Asset Management, Safety and Automation			
39 – Advanced Distribution Management System (ADMS)			X
40 – Solar Power Prediction			X
41 – Optimization of Pricing and Resource (OPRA)		X	
42 – Condition-Based Maintenance- Gas Circuit Breakers			X
43 – Smart Grid Enabled Energy Efficiency	X		
44 – Second Use of EV/PEV Batteries in Stationary Applications		X	
Security			
45 – Cybersecurity Project			X
46 – Customer Privacy Program	X		
47 – Substation Physical Security Hardening			X
Integrated and Cross-cutting Systems			
48 – Integrated Test Facility			X
49 – SDG&E Grid Communication Systems (SGCS)		X	
50 – Electric Program Investment Change (EPIC)			X
51 – Unmanned Aircraft System (UAS)			X
52 – Smart Grid 2.0 Engineering & Architecture			X
53 – Workforce Development			X
54 – Data Management and Analytics			X
55 – CES-21 (Livermore Labs)			X

2.5.2.2 CUSTOMER ENGAGEMENT TIMELINE

Projects assessed as requiring Direct Customer Outreach are grouped based on four customer engagement initiatives: Enablement Tools, Customer Premise Devices, Rates and Programs, and Pilot Deployment Projects. For each project, a timeline has been developed, show in Table 7.

Table 7: Customer Outreach and Engagement Timeline by Initiative

Direct Customer Outreach	2014	2015
Enablement Tools		
Connected…to the Sun	X	X
Green Button Connect My Data	X	X
Customer Premise Devices		
Smart Meters	X	X
HAN Projects	X	X
Rates and Programs		
Smart Grid Demand Response	X	X
Electric Vehicle (Clean Transportation) Education and Outreach	X	X
Smart Pricing Program (Dynamic Pricing)	X	X
Digital Roadmap	X	X
Community and Stakeholder Engagement	X	X
Smart Grid Enabled Energy Efficiency	X	X
Customer Privacy Program	X	X
Pilot Deployment Projects		
Borrego Springs Microgrid	X	X
EV Demand Response (G2V)	X	X

2.5.3 OVERVIEW OF THE CUSTOMER ENGAGEMENT PLAN

For each customer engagement initiative outlined in the above Customer Engagement Timeline (Table 7), section 2.5.4 - Smart Grid by Engagement Initiative - provides more detail on existing or planned customer outreach and engagement activities, including the target audience, messaging, current roadblocks and strategies to overcome those roadblocks. SDG&E's goal is to offer the right information to the right customer through the right channel at the right time to enable customers to adopt smart energy solutions and make informed energy management decisions. Collectively, these are the projects that "...will create a utility foundation for an innovative, connected, and sustainable energy future."[24] Through these projects, SDG&E will work with customers and service providers to increase customer engagement with and adoption of new energy management technologies and behaviors. From a Smart Customer perspective, this will give consumers the opportunity to capture the benefits of a wide range

[24] SDG&E *Smart Grid Deployment Plan* 2012 Annual Report, Oct. 1, 2012.

of existing and emerging energy technologies and associated energy management products and services.

These projects allow customers to "... be aware, informed and knowledgeable about their energy choices, and have the tools to act upon those choices."[25] As stated in its *Smart Grid Deployment Plan*, "SDG&E recognizes that engaging with and proactively reaching out to customers is critical to the success of its Smart Meter deployment and Smart Grid utilization efficiency." These projects continue that journey.

2.5.4 SMART GRID BY ENGAGEMENT INITIATIVE

In this section, SDG&E describes the customer engagement elements for each initiative identified in Table 7 above, as requested by CPUC Staff in its March 1, 2012 Smart Grid Workshop Report contained in Tables 8 through 11.

Table 8: Customer Engagement Initiative - Enablement Tools

Related Projects	**Green Button Connect My Data, Connected…to the Sun**
Project Description	- Provide energy usage information directly to customers or securely to their designated third parties, empowering innovation and valued energy-related services to customers - Provide customers greater pricing plan options including green rates
Target Audience	- Primarily residential and small commercial customers (< 20 kW peak load)
Sample Message	- Download your electricity use data with the simple click of a button and share it securely with third parties to help you understand your energy use - Providing all customers with access to local solar generation
Source of Messaging	- Utility - Third-party partners
Current	- Customers are not aware of how much energy they use, when they use it, or

[25] Ibid.

Related Projects	Green Button Connect My Data, Connected…to the Sun
Roadblocks	how much it costs - Energy Usage is a low-engagement activity where many customers would rather not spend time thinking about their energy usage or costs - Overcoming language, ethnic, and cultural barriers to provide a direct and positive impact for SDG&E's most vulnerable populations - Some customers desire other information services providers than the utility - Customers who want to install a PV system but cannot due to multiple constraints (such as multi-dwelling units or limited roof space and orientation) - Customers don't know what new energy saving technologies are available
Strategy to Overcome Roadblocks	- Find new and better ways to engage customers using 1) social gaming 2) personalized energy reports 3) a customer preference center that will allow customers to select their preferred channel of communication for energy related information - Act as a trusted energy advisor by promoting programs (and pricing options as they come available) - Understand customer segments and how they want to be engaged - Provide green rate options and programs using local solar generation

Table 9: Customer Engagement Initiative - Customer Premise Devices

Related Projects	Smart Meters, Home Area Networks (HAN)
Project Description	- Enable customers to have an unprecedented understanding of their energy usage - Ensure that the HAN capabilities in Smart Meters continue to be tested and developed
Target Audience	- All customers across SDG&E service territory with a Smart Meter - HAN devices are primarily residential and small commercial customers (< 20

Related Projects	Smart Meters, Home Area Networks (HAN)
	kW peak load)
Sample Message	- Smart Meters will help save energy and money - Smart Meters allow for two-way communication between the customer and the utility - This new technology will also help you make smart choices to save energy and money on your bill
Source of Messaging	- Utility
Current Roadblocks	- Customers are not aware of how much energy they use, when they use it, or how much it costs - Customers may opt-out of Smart Meters in growing numbers - Energy Usage is a low-engagement activity where many customers would rather not spend time thinking about their energy usage or costs - Most residential and small commercial customers (< 20 kW peak load) are not financially rewarded for shifting their energy use to off peak periods – especially on critical days - Some customers desire information services providers other than the utility - Customer HANs may be more about security and entertainment, not energy usage - Customers who might benefit from reducing use on critical days have a low awareness level
Strategy to Overcome Roadblocks	- Ensure that energy usage information is available in the premise on a near real-time basis supporting smart appliances and other in-home devices - Allow energy usage information to be available over the air and, therefore, part of the mix as customer in-home wireless networks develop - Enable relevant technology solutions to support EE/DR signals (such as programmable communicating thermostats) for customers opting in or transitioning to time variant rates - Provide up to two years of bill protections to allow customers to try these technologies and new pricing options risk free

Related Projects	Smart Meters, Home Area Networks (HAN)
	- Continue to explain the benefits of having a Smart Meter (enabling real-time usage data) and integrate with the applications being developed to view that data and technologies to engage participation in programs that benefit the customer

Table 10: Customer Engagement Initiative - Rates and Programs

Related Projects	Smart Grid Demand Response, Smart Pricing Program, Clean Transportation Outreach and Education, Digital Roadmap, Smart Grid Enabled Energy Efficiency, Customer Privacy Program, Community and Stakeholder Engagement
Project Description	- Provide customers greater pricing plan options that better meet their needs – including time-variant rates - Provide incentives and capabilities for customers, if they choose to participate, to vary their load in response to price or other signals (demand response) - Provide customers information on EV time-of-use rates and help them understand the benefits of charging their car when prices are at their lowest. Ensure that customer privacy is fully integrated into the way SDG&E does business and that customer privacy controls are in place and working effectively
Target Audience	- All customers across SDG&E service territory with a Smart Meter that could benefit from load shifting with the proper pricing plan options - EV drivers and those looking to purchase or lease EVs, car dealers, car manufacturers, property owners and managers considering charging, and fleet operators - Policy makers (legislators, CPUC, CARB, CEC) - Communities and local stakeholders

Related Projects	**Smart Grid Demand Response, Smart Pricing Program, Clean Transportation Outreach and Education, Digital Roadmap, Smart Grid Enabled Energy Efficiency, Customer Privacy Program, Community and Stakeholder Engagement**
Sample Message	- Save Energy between 11 a.m. and 6 p.m. on Reduce Your Use days and you'll be rewarded with a credit on your SDG&E bill - SDG&E believes privacy is a fundamental right of every customer. SDG&E has a strong commitment to protecting customer data and takes the issue of customer privacy very seriously. The utility is doing its part to advocate for privacy on behalf of customers and the community - Our EV rates will help you pay the lowest price for your EV fuel, when charging from midnight to 5 a.m. Driving an EV reduces your carbon footprint and shows you support energy independence and reduced petroleum imports - Assist California in meeting its goals to reduce 13 million tons of greenhouse gasses by 2020 –about 40% come from transportation
Source of Messaging	- Utility
Current Roadblocks	- Most customers are not aware of new rate choices - Customers who want to install a PV system but cannot due to multiple factors - Some customers are becoming more concerned with privacy as it relates to the operations of the electric and gas utility, especially smart meters and other smart devices that collect and share usage and other data) - Small commercial customers (<20 kW peak load) that transition to TOU pricing by default are not aware how this will impact their bill based on current usage patterns - Residential customers with TOU rate options, do not have the tools available or are not aware of their options - Small business customers in particular are not able to deal with TOU pricing generally in many cases due to the nature of their business (hours of operation)

Related Projects	**Smart Grid Demand Response, Smart Pricing Program, Clean Transportation Outreach and Education, Digital Roadmap, Smart Grid Enabled Energy Efficiency, Customer Privacy Program, Community and Stakeholder Engagement**
Strategy to Overcome Roadblocks	- Drive customer enrollment in My Account and encourage customers to engage with the new Energy Management Tool - Act as a trusted energy advisor by promoting programs (and pricing options as they become available) - Implement a Reduce Your Use program with financial incentives for energy savings below baseline use - Utilize mass media and individual's preferred channel to communicate when Reduce Your Use Days are called - Weave Reduce Your Use Day messages into a wide range of company communications to raise customer awareness levels - Provide green rate options using local solar generation - Provide tools to conduct a meaningful analysis of new rate choices - Provide protections to allow customers to try these technologies and new pricing options at low or no risk

Table 11: Customer Engagement Initiative - Pilot Deployment Projects

Related Projects	Borrego Springs Microgrid, EV Demand Response
Project Description	- Demonstrate improved reliability with distributed energy resources on a remote community's grid. - Ensure, if and when current CPUC policy changes, that grid-integrated PEV charging is readily available to customers who need it
Target Audience	- Primarily residential and small commercial customers (< 20 kW peak load); some medium and large commercial customers with vehicle fleets and multiple locations
Sample Message	- Microgrid technologies can help improve electric system reliability. - Our EV rates will help you pay the lowest price for EV fuel.
Source of Messaging	- Utility - Third-party partners
Current Roadblocks	- Microgrid technologies can be complex and difficult to explain. - TOU and other dynamic rates can be challenging for some customers.
Strategy to Overcome Roadblocks	- Use direct interactions (e.g. community meetings) and easy to understand materials to explain benefits of microgrids. - Develop easy to use tools for customers to simplify management TOU and other dynamic rates.

2.6 KEY RISKS BY CATEGORY

The following table discusses key Smart Grid risk categories and their likelihood, potential impact, and actions taken by SDG&E to reduce or mitigate risks in these areas.

Table 12: Risk Assessment Information by Category

Key Risk Category	Likelihood/Probability	Impact/Consequences	Actions Taken
1. **Reliability**	High Many factors, including the intermittency of renewable generation sources, changes in load patterns, breaches of system security, and other impacts of new technologies, have the potential to negatively affect system and local distribution reliability.	High Particularly where intermittent distributed renewables, electric vehicles, and other new technologies are concentrated into clusters, the impacts of intermittent supply or demand can be significant.	Many Smart Grid projects undertaken by SDG&E are designed to maintain or improve overall and distribution system reliability, including projects in each of the six program areas addressed in this *Annual Report*.
2. **Rates**	High The probability that current retail rate designs will trigger significant consequences to the deployment of renewables and require Smart Grid technologies is high.	High Current electric rate policies provide unsustainable and inaccurate pricing signals to customers. Current policies force increases in fixed system costs to be allocated only into tiers 3 and 4, because of protections that cap increases to tier 1 and 2 rates.	SDG&E is working with the CPUC and stakeholders to develop changes in NEM and other residential rate structures that would more equitably allocate the costs for electric reliability services provided by the utility.

Key Risk Category	Likelihood/Probability	Impact/Consequences	Actions Taken
3. **Security**	High No networked system can be perfectly secure, thus the probability that some security-related issue will affect the operation of the system is high.	High Security-related threats to Smart Grid systems have the potential to impact the reliability of the transmission and/or distribution networks, and could affect worker and public safety.	SDG&E has a robust and comprehensive risk-based security program that addresses and mitigates these risks, employing defense-in-depth and other strategies.
4. **Safety**	Medium While the Smart Grid has the potential to introduce new safety risks, the well-established safety culture of the utility and robust processes that help maintain workforce and public safety diminish the probability that new safety risks will be realized.	High The consequences of safety risks that are realized can be devastating.	SDG&E works to continually improve its safety standards, education and awareness, and has a number of Smart Grid and other projects that contribute to maintaining or improving safety of its workforce and the public.
5. **Technology**	High Smart Grid deployment involves a great deal of new or emerging technologies, many of which lack consistent, interoperable industry standards. It is highly probable that a lack of or inconsistency in standards will impact deployments.	Medium Many other major technology deployments have been similarly affected in the past. Mitigation efforts can keep these risks from having high impacts on Smart Grid deployments.	SDG&E leverages its Integrated Test Facility to test interoperability and reduce technical risks in deployment projects.

2.7 SECURITY RISK AND PRIVACY THREAT ASSESSMENT UPDATES

In its *Smart Grid Deployment Plan*, SDG&E discussed its vision for physical and cyber security as well as its strategy for achieving its security goals. Its vision for the security of Smart Grid stated:

> *"… by 2020 all Smart Grid participants, from customers to service providers, to regulators, to utilities, must be able to rely on the availability of the system; trust the integrity of the information produced by the system; and be confident that sensitive information is secure from unauthorized access or disclosure. SDG&E's Smart Grid must be resistant to physical and cyber security threats, as well as resilient to attack and natural disasters. It must be aligned with industry standards and best practices. Because resources are finite, it must be built on a security program that uses well-established risk management methodologies to maximize its security investments."*

The approach to fulfilling the vision and strategy continues to be refined as progress is made demonstrating key technologies. During the initial deployment years, the focus is on building the infrastructure necessary to support a resilient, distributed grid system and adapting existing tools and processes to the Smart Grid.

2.7.1 THREAT LANDSCAPE

Cyber security threats continue to evolve, targeting critical infrastructure. Computerized systems continue to be integrated in new ways while threat agents learn about controls systems, communications infrastructure, and other potentially vulnerable components. Attacker tools are adding modules designed to be used against SCADA systems, embedded systems, and communication protocols that could potentially reveal vulnerabilities before they can be remediated.

With the national visibility on the issue, new products and technologies are becoming available to improve the security posture of the SDG&E Smart Grid. These include quantum encryption, network anomaly attack detection, advanced persistent threat protection, and substation gateway technologies marketed towards ensuring NERC CIP version 5 compliance.

One example of how SDGE better understands the evolving threat landscape is threat intelligence services focused specifically on Smart Grid and Industrial Control System (ICS) threats. This allows SDG&E to communicate creditable threats against the company's systems to the affected asset owners and operators so proactive actions can occur.

2.7.2 GOVERNANCE, RISK AND COMPLIANCE

An example of how SDG&E is addressing risks through its implementation of Governance, Risk, and Compliance processes and solutions. Compliance, and transparency of compliance activities, is

recognized internally at SDG&E as an important part of its Information Security program. Meeting legal, regulatory, and company requirements should be a by-product of good security and privacy programs. SDG&E has been deploying Governance, Risk, Compliance Management (GRCM) tools that enhance the ability to track information assets and map them to security controls.

This effort has continued to integrate cybersecurity processes into the GRCM tools to advance the infrastructure for identifying and tracking the information and cyber assets used within the Smart Grid, incorporated security operations activities, such as vulnerability management, threat management, cybersecurity engineering, and incident response, into a dashboard-style executive view as well as technical reports for control owners. Control frameworks are used to support periodic compliance reviews. Any deficiencies are tracked and managed via corrective action plans or risk exceptions within the GRCM solution. Vulnerability management processes integrate with compliance activity to provide visibility into progress reducing risks due to technology or processes.

2.7.2.1 RESEARCHING AND LOOKING AHEAD

SDG&E recognizes that security is not an end state, but a continual process of improvement, which will continue as long as SDG&E is in business. With that said, looking ahead and planning for the future to ensure SDG&E's strategic security goals are met is extremely important. One example of where security-related efforts are focused is in improving threat and network anomaly detection capabilities. SDG&E is currently working to enhance its ability to monitor distribution SCADA systems and networks.

2.7.2.2 CUSTOMER PRIVACY

Over the last year, energy data privacy has remained a common topic in Smart Grid forums. SDG&E takes customer energy privacy very seriously, and in the Reporting Period, made great strides in continuing to implement its customer privacy initiatives company-wide. What began as a simple customer privacy program in 2012 has become the SDG&E Office of Customer Privacy (OCP). Previously, SDG&E selected the Generally Accepted Privacy Principles (GAPP) as its privacy framework and developed its first set of privacy controls that combines elements of this framework with other regulatory obligations, and Privacy by Design. The OCP built a Privacy Impact Assessment methodology that is used by project teams and process owners to assess privacy risk in their activities. It has automated its internal process for sharing customer data with third parties to allow for better tracking and information assurance.

Smart Grid privacy mandates require SDG&E to complete an audit report of its privacy and security practices with its General Rate Case filings. In early 2014 SDG&E engaged a vendor to begin this comprehensive audit process in time for its 2014 GRC filing.

In May 2014, SDG&E and other California Public Utilities were ordered to plan and implement a) websites for publishing aggregated customer usage data by zip code and customer type, and b) a data

request and release process for sharing customer data with select third parties. SDG&E is in the process of planning for the development of solutions that meet these new requirements.

The OCP continues to build its program and prepare the company, its partners, and its customers for future privacy risks. In particular, the desire by a growing number and variety of third parties to have access to customer energy data represents a considerable risk to customer privacy. Providing better awareness and guidance to third parties around the protection of customer privacy is a key consideration and has been built into the company's enterprise Governance, Risk and Compliance Management system. In addition, SDG&E is working with partners such as the Information and Privacy Commissioner of Ontario and the Identify Theft Resource Center to improve its privacy program, and with Microsoft on conceptual tools to provide third parties access to customer information in a way that provide them more value while better protecting customer privacy. Another risk to customer privacy is conflicting legislation between governmental organizations that require utilities to take steps to protect customer privacy, and others that demand customer usage data for their broad environmental agendas. The OCP will remain engaged with federal, state and local legislators to help manage the balance between reasonable and effective customer privacy and these important environmental goals.

2.7.3 CONCLUSION

Security and privacy remain high priorities for SDG&E. SDG&E continues to execute the strategy laid out in its *Smart Grid Deployment Plan* by building the centralized management systems to support future distributed security solutions necessary to support the field technologies.

Advanced cybersecurity capabilities provide support to new Smart Grid solutions from both the information technology (IT) and operational perspectives. SDG&E continues to invest in risk and vulnerability management, compliance, operations, research, and privacy solutions. The creation of the Office of Customer Privacy formalizes policies, processes and procedures to help employees, contractors, authorized third parties and customers to safeguard customer information in an increasingly interconnected system.

Next year, SDG&E will continue to build upon these foundational components to both expand the oversight activities and implementing additional security capabilities extending into the field.

2.8 COMPLIANCE WITH NERC SECURITY RULES AND OTHER SECURITY GUIDELINES

SDG&E is a NERC registered Transmission Owner (TO) and Transmission Operator (TOP). NERC's Critical Infrastructure Protection Reliability Standards (often referred to as Cyber Security) are applicable to those entities that are registered Transmission Owners and Transmission Operators. The NERC Critical Infrastructure Protection Reliability Standards have been mandatory and enforceable since June of 2009, and SDG&E has certified its TO and TOP annual compliance each year since June 2009.

3 SMART GRID METRICS

In SDG&E's reporting of metrics in the following section, the Reporting Period is defined as the period from July 1, 2013 through June 30, 2014. Metrics are reported per the definitions in D-12-04-025, retrievable at http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/164808.PDF.

A. Customer / AMI Metrics

1. Number of advanced meter malfunctions where customer electric service is disrupted, and the percentage this number represents of the total of installed advanced meters.

Metric	Units	Reporting Period Value
Number of meters	Meters	10
Percentage of meters	%	.00007 %

2. Load impact in MW of peak load reduction from the summer peak and from winter peak due to Smart Grid-enabled, utility-administered DR programs (in total and by customer class).

Metric	Units	Reporting Period Value
Residential	MW	21
C&I < 500 kW	MW	14
C&I > 500 kW	MW	6
Other	MW	4
Total		45
Load Impact of Peak Load Reduction from the winter peak:		
Residential	MW	n/a
C&I < 500 kW	MW	n/a
C&I > 500 kW	MW	n/a
Other	MW	n/a
Total		n/a

***Note**: Some SDG&E DR programs are available in the winter months, but SDG&E did not call an event during the winter of 2013-14. Therefore, there is no load reduction from the winter peak to report.*

3. Percentage of demand response enabled by AutoDR (Automated Demand Response) in each individual DR impact program.

Metric	Units	Reporting Period Value
Percentage of demand response enabled by AutoDR – Capacity	%	0%
Percentage of demand response enabled by AutoDR – Critical Peak	%	8%

4. The number and percentage of utility-owned advanced meters with consumer devices with HAN or comparable consumer energy monitoring or measurement devices registered with the utility (by customer class, CARE status, and climate zone).

Metric	Units	Reporting Period Value
By Customer Class		
Residential	# / %	4114 / 0,0291
C&I < 500 kW	# / %	112 / 0.008%
C&I > 500 kW	# / %	0 / 0%
Other	# / %	0 / 0%
Total by Customer Class		**4226 / 0.299%**
CARE	# / %	531 / 0.038%
Non-CARE	# / %	3695 / 0.262%
Total by CARE/non-CARE		**4226 / 0.299%%**
Coastal	# / %	1414 / 0.100%
Inland	# / %	2699 / 0.191%
Mountain	# / %	66 / 0.005%
Desert	# / %	47 / 0.003%
Total by Climate Zone		**4226 /0.299%**

5. Number and percentage of customers that are on a time-variant or dynamic pricing tariff (by type of tariff, by customer class, by CARE status, and by climate zone).

Metric	Units / Percentage	Reporting Period Value
By Type of Tariff		
Critical Peak Pricing (CPP)	# / %	1,160 / 0.078%
Time of Use (TOU)	# / %	29,960 / 2.121%
Enrolled in Peak Time Rebate[26] (PTR) Notifications	# / %	50,034 / 3.541%
Separately Metered Plug-in Electric Vehicle (PEV) Rates	# / %	357 / 0.025%
By Customer Class		**# / % of Customer Class**
Residential	# / %	6261 / 0.498%
C&I < 500 kW	# / %	24,502 / 15.844%%
C&I > 500 kW	# / %	660/ 100.0%
Other	# / %	n/a
By CARE Status		
CARE	# / %	212 / 0.015%
Non-CARE	# / %	31,211 / 2.209%
By Climate Zone		**# / % of Climate Zone Customers**
Coastal	# / %	19,564 / 2.421%
Inland	# / %	11,310 / 1.910%

[26] SDG&E's PTR program is branded as "Reduce Your Use".

Metric	Units / Percentage	Reporting Period Value
Mountain	# / %	431 / 2.392%
Desert	# / %	107 / 2.940%

6. Number and percentage of escalated customer complaints related to (1) the accuracy, functioning, or installation of advanced meters or (2) the functioning of a utility-administered HAN with registered consumer devices.

Metric / Category of Complaints	Units	Reporting Period Value
AMI Meter complaints	#	4
AMI Program complaints	#	1 escalated (Reduce Your Use)
Device Registration (HAN)	#	0
Communication Issues (HAN)	#	0
HAN, other (primarily opting out of the various HAN pilots)	#	0

7. The number and percentage of advanced meters replaced before the end of their expected useful life during the course of one year, reported annually, with an explanation for the replacement.

Metric	Units	Reporting Period Value
Replaced due to hardware/component failures:	# / %	1,560 / 0.110%

Metric	Units	Reporting Period Value
Replaced due to firmware related failures:	# / %	2,449 / 0.173%
Replaced due to environmental related failures:	# / %	127/ 0.009%
Replaced due to unknown or communication related failures:	# / %	855 / 0.060%

8. Number and percentage of advanced meters field-tested at the request of customers pursuant to utility tariffs providing for such field tests, and the number of advanced meters tested measuring usage outside CPUC-mandated accuracy bands.

Metric	Units	Reporting Period Value
Number / percentage of advanced meters field tested (at the request of customers):	# / %	670 / 0.047%
Number / percentage of advanced meters field tested at the request of customers with results outside accuracy band:	# / %	2 / 0.0001%

9. Number and percentage of customers using a utility web-based portal to access energy usage information or to enroll in utility energy information programs or who have authorized the utility to provide a third-party with energy usage data.

Metric	Units	Reporting Period Value
Number/Percentage of customers using a web-based utility portal to access energy usage information[27]	# / %	323,293 / 52.90%
Number/percentage of customers using a web-based portal to enroll in utility energy information programs[28]	# / %	756,112 / 52.2%[29]
Number / percentage of customers using a utility web-based portal to authorize the utility to provide a third party with energy usage data[30]	# / %	3,092 / 0.43%

B. Plug-in Electric Vehicle Metrics

1. Number of customers enrolled in time-variant electric vehicles tariffs

Metric	Units	Reporting Period Value
Number of customers	Customers	3,982

For SDG&E, the applicable tariffs for this metric are EV-TOU, EV-TOU-2, EPEV-X, EPEV-Y, and EPEV-Z

[27] This number represents "unique customers" using SDG&E MyEnergy Portal
[28] This number includes all active users of My Account, SDGE.com and Mobile apps.
[29] This percentage reflects the ratio of billable accounts at the end of 2013 utilizing the web-based or mobile platform
[30] This represents the total number of customers authorizing SDG&E to share directly with a designated third party.

C. Storage Metrics

1. MW and MWh per year of utility-owned or operated energy storage interconnected at the transmission or distribution system level, as measured at the storage device electricity output terminals.

Metric	Units	Reporting Period Value
Grid connected energy storage: pumped stored hydro[31]	MW	40
Grid connected energy storage: pumped stored hydro	MWh	36,504 pump load 28,848 generated
Grid connected energy storage: non-hydro	MW	3.473
Grid connected energy storage: non-hydro	MWh	233 charged 143.6 discharged

[31] The pumped stored hydro system referred to here is the Lake Hodges pumped storage facility. The non-hydro energy storage systems are batteries.

D. Grid Operations Metrics

1. The system-wide total number of minutes per year of sustained outage per customer served as reflected by the System Average Interruption Duration Index (SAIDI), Major Events Included and Excluded for each year starting on July 1, 2011 through the latest year that this information is available.

Metric	Units	Reporting Period Value
SAIDI - Major Events Included	SAIDI index	87.41
SAIDI - Major Events Excluded	SAIDI index	66.16

2. How often the system-wide average customer was interrupted in the reporting year as reflected by the System Average Interruption Frequency Index (SAIFI), Major Events Included and Excluded for each year starting on July 1, 2011 through the latest year that this information is available.

Metric	Units	Reporting Period Value
SAIFI - Major Events Included	SAIFI index	0.6797
SAIFI - Major Events Excluded	SAIFI index	0.5770

3. The number of momentary outages per customer system-wide per year as reflected by the Momentary Average Interruption Frequency Index (MAIFI), Major Events Included and Excluded for each year starting on July 1, 2011 through the latest year that this information is available.

Metric	Units	Reporting Period Value
MAIFI - Major Events Included	MAIFI index	0.2099
MAIFI - Major Events Excluded	MAIFI index	0.2079

4. Number and percentage of customers per year and circuits per year experiencing greater than 12 sustained outages for each year starting on July 1, 2011 through the latest year that this information is available.

SDG&E Customers / Circuits Experiencing >12 Sustained Outages		
Metric	**Units**	**Reporting Period Value**
Number of customers	Customers, # / %	97 / 0.01%

SDG&E Customers / Circuits Experiencing >12 Sustained Outages		
Metric	**Units**	**Reporting Period Value**
Number of circuits	Circuits, # / %	5 / 0.05%

5. System load factor and load factor by customer class for each year starting on July 1, 2011 through the latest year that this information is available.

Metric	Units	Reporting Period Value
System Load Factor	% load factor	49%
Load Factor - Residential	% load factor	44%
Load Factor - C&I < 500 kW	% load factor	54%
Load Factor - C&I > 500 kW	% load factor	76%
Load Factor - Other[32]	% load factor	49%

6. Number of and total nameplate capacity of customer-owned or operated, grid-connected distributed generation facilities.

Metric	Units	Reporting Period Value
Distributed generation facilities – solar	Number of units / Capacity of units - MW	38,978 / 268.97 MW
Distributed generation facilities – non-solar	Number of units / Capacity of units - MW	103 / 216.6 MW
Distributed generation facilities – solar and non-solar total	Number of units / Capacity of units - MW	39,081 / 485.6 MW

Distributed generation facilities include those under NEM tariffs as well as non-NEM DG owned by the utility or third parties.

[32] Other is composed of small agriculture.

7. Total electricity deliveries from customer-owned or operated, grid-connected distributed generation facilities, reported by month and my ISO sub-Load Aggregation Point.

Metric	Units	Reporting Period Value
Total annual electricity deliveries from customer-	GWh	1,205.6

8. Number and percentage of distribution circuits equipped with automation or remote control equipment, including SCADA systems.

Metric	Units	Reporting Period Value
Number of circuits	Circuits	804
Percentage of circuits	%	79.1%

If the definition of remote control equipment is considered broadly, one interpretation of the term could match to the turn on/turn off functionality within SDG&E's Smart Meters. In that more general case of remote control, 100% of SDG&E's distribution circuits have Smart Meters, and therefore remote control capabilities.

[33] California Energy Demand 2014-2024 Staff Final Forecast – Low Demand Case, File 04 SDGE Low.xls, Form 1.2; retrieved from http://www.energy.ca.gov/2013_energypolicy/documents/demand-forecast_CMF/low_case/